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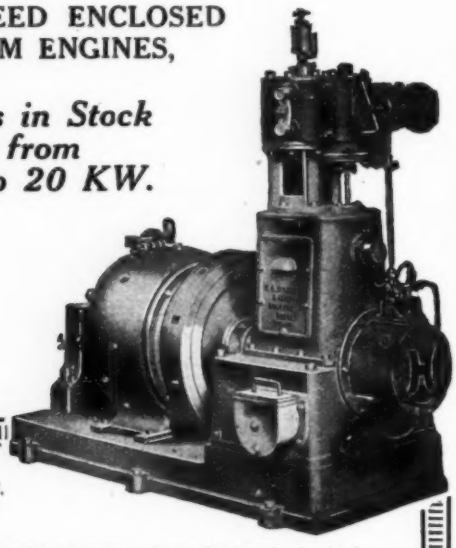

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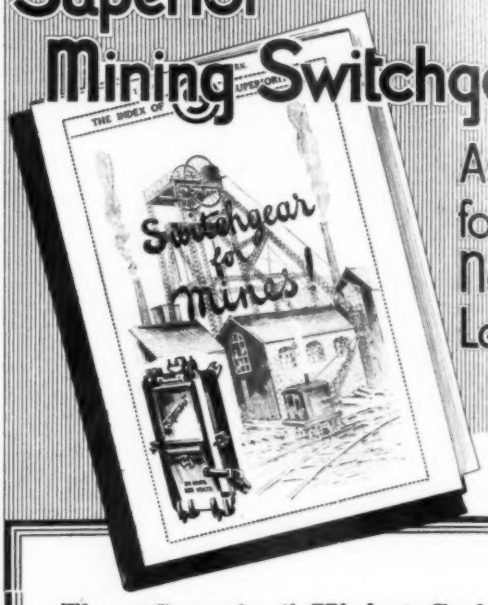

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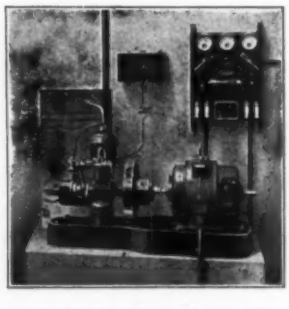

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The

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Imperial Radio Communication.

FROM the speech of Senator G. Marconi at the annual general meeting of Marconi's Wireless Telegraph Co., reported in this issue, we are glad to learn that the relations between the company and the Postmaster-General have entered upon a new phase, of a "more friendly" character, and that the basis of an agreement has been reached with regard to the payment due to the company for its war services; in addition, the terms of reference to the arbitrator, Lord Buckmaster, in respect of the payment to be made for the use of the company's patents by the three Government Departments representing the fighting Services have now been agreed, and the matter will probably be adjudicated in the autumn. No better illustration could be found of the disastrous effects upon commercial progress of dissension between authorities than the history of radio-telegraphy in this country; we had the opportunity to lead the world in this new art, and but for the continual bickering and chaffering that have spragged the wheels, we should undoubtedly have occupied the same position with regard to wireless communication that we attained and have maintained from the commencement in submarine telegraphy.

Now at last, we hope, the handicap will be removed, and we look forward to the rapid development of radio communication between this country and the whole world.

According to the reports that have recently appeared in our pages, the Government has sanctioned the erection of a station by the company to communicate first with Canada, and later with Australia, India, and South Africa on the short-wave directional system, at the company's risk. Corresponding stations are, of course, to be set up in the Dominions, and the stations are to be

completed within six months from the allocation of sites for the purpose. Apparently the British stations, if successful, will be paid for at a defined rate by the Government, and the Marconi company will receive royalties at the rate of 6¼ per cent. on the total receipts. According to Signor Marconi, the agreement satisfies both parties, and should prove far more profitable to the company than the abortive agreement of 1913 could ever have been. On the other hand, in submitting the agreement to the House of Commons, Mr. Vernon Hartshorn said the company had met the Government in a very fair manner, and deserved recognition for the pioneer work which it had carried out. Moreover, Senator Marconi announced that the company had practically reached agreement with the Post Office with regard to the granting of a licence for the conduct of wireless telegraph services "with all the rest of the world outside Europe," and foreshadowed the grant of a further licence for a great part of Europe also.

All this is very satisfactory. Although one wonders why a similar result could not have been attained long ago—for instance, when Mr. Bonar Law announced the decision of the Cabinet to grant licences freely for communication with other countries—this is not the time for fixing the responsibility for intransigence, but rather for congratulating ourselves and the nation on the removal of a long-standing reproach.

And now, as before, we would say: get on with the work as quickly as possible; the Empire urgently needs improved facilities for communication.

International Conferences.

In our last issue we drew attention to the International Conference on Extra-High-Pressure Networks which will meet for the third time in June, 1925. The first conference was attended by 53 delegates, the second by 150, and it is anticipated that the third will attract a still larger number; a permanent secretariat has been set up under the ægis of the Union des Syndicats de l'Electricité, with M. Tribot Laspière in command, and the future of the series of meetings appears to be assured.

On the other hand, the World Power Conference at the British Empire Exhibition, which was of unprecedented magnitude and importance, and which necessarily included within its comprehensive scope all the matters dealt with by the International High-Pressure Conference, unanimously resolved that its work should be continued and that a permanent organisation should be set up for the purpose, including the establishment of National Committees.

The question obviously arises, therefore, whether it is possible to co-ordinate the activities of these two institutions—perhaps even by amalgamation. Already the High-Pressure Conference includes within its programme the generation of electrical energy in both thermal and hydraulic stations, as well as the interconnection of the stations and the construction and operation of the transmission lines, and reference to the published proceedings at the first meeting shows that the papers submitted covered also legislation, official regulations, the construction of generating and transforming plant and switchgear, low-pressure distribution, and tariffs. There is bound to be a considerable measure of duplication when so much of the field is common to both organisations, and duplication means both waste and weakness, for if each were to hold biennial meetings (the system already adopted by the High-Pressure Conference), there would be a conference every year, which is too short an interval for any but the most leisured and opulent globe-trotting engineers.

We suggest, therefore, that there is a very sound case for the proposition that we put forward—namely, that steps should be taken to promote the union or the collaboration of the two institutions which have come into existence and which are in essence so closely related.

Outdoor Sub-stations for Rural Distribution.

The near future promises important developments in the supply of electricity to rural districts. As the consumers are in isolated farms and small hamlets, the resultant load is naturally sparsely distributed; this necessitates an economical but reliable construction of lines. The trend of development is for high-voltage feeders to be run from the generating station to secondary sub-stations at convenient centres, where the supply is transformed down to the pressure at which it is distributed to the consumers. The main feeders are invariably overhead and constructed on standard lines.

It is in the provision of such sub-stations that costs mount up to a figure out of all proportion to the value of the supply taken; these small transformer stations have therefore to be of the simplest possible construction consistent with reliability. The average capacity of the individual loads will vary from 2 to 15 kVA, and the usual brick-built transformer house is prohibitive in cost. As a result, engineers have been turning their attention to the erection of outdoor sub-stations. Usually the smaller transformers are mounted on a cross-arm on one of the line poles; as weatherproof transformers cost only 15 per cent. more than indoor-type transformers of the same rating, this makes a cheap and effective arrangement for sizes up to 5 kVA.

For larger transformers, however, the weight, together with the mounting of the necessary switchgear and protective apparatus, must be taken into account. The latter is of the outdoor-pattern air-break type and, while not particularly heavy in itself, takes up considerable room.

In the case of intermediate and large sizes, ground-mounted transformers are used to a certain extent. A concrete platform is made immediately below the pole and the transformer and switchgear are mounted thereon. Outdoor sub-stations have been developed on these lines for capacities up to 10,000 kVA. The whole of the gear must be surrounded by an unclimbable fence strong enough to withstand use as a rubbing post by cattle, and this makes a considerable addition to the cost per kVA in the case of sub-stations of small capacity.

For these stations, platform mounting is undoubtedly the best solution. A light wooden platform ten or twelve feet in height is erected against the pole, which may itself form one member of the structure. The transformer and its switchgear are mounted on this. There is ample room for everything, and the lineman can work in safety and comfort, a point which cannot be claimed for the pole-mounted sub-stations. A few strands of barbed wire are sufficient to render the platform safe from inquisitive schoolboys.

Platform-mounted sub-stations as described above are extensively used abroad; in several of the New Zealand electrification schemes this construction is used for the secondary sub-stations of 500 kVA capacity for 33,000/3,300 volts pressure.

The Swedish State-owned system has very few pole-type transformers. For small stations the line is carried on an H pole at the tapping point, and a small platform, complete with guard rails, carrying the transformer and switchgear is mounted on the horizontal member.

Still further economies in cost may be effected by ordering material in bulk. In this country an order for six transformers to the same design is regarded as a large one. In the United States, small outdoor-type units are ordered in hundreds, and the price is consequently much more favourable. Standardisation of supply frequencies, voltages, and capacities of transformers in this country would be of great benefit from this point of view. The same remarks apply also to the switchgear and protective apparatus.

A number of manufacturers still supply c.i. tanks for small outdoor-pattern transformers. In first cost they are cheaper than welded sheet-steel tanks, but this is outweighed by their liability to fracture in transit or in the event of a pole being brought down. The

latter event is sure to break a c.i. tank and damage the windings, whereas a steel tank would only be buckled, the windings would be undamaged, and the tank itself might very well remain oil-tight.

Illuminating Engineering at Wembley.

The Conference on Illuminating Engineering at Wembley on August 12th was devoted mainly to discussion of methods of arousing public interest in good lighting, and a resolution was passed approving of the proposal of the Illuminating Engineering Society, in co-operation with other bodies, to initiate a comprehensive scheme with this object. Considering that the Conference took place in the holiday season, the attendance was remarkably good, and the fact that so many different bodies and interests were represented augurs well for the proposed effort to conduct illuminating engineering propoganda on a large scale. The time is ripe for more intensive methods, and all sections of the lighting industry would do well to sink their differences and pool their efforts in the common cause. We are not infrequently asked to admire the manner in which such things are done in the United States, and we agree that in propaganda work they have been remarkably successful. But the secret of this success is revealed in the papers by Messrs. Lieb, Merrill, and Powell, which Mr. Gaster used very largely as the text of his address. It is based on wholehearted co-operation of manufacturers and supply undertakings, and willingness to allow their joint efforts, and those of other independent bodies, to be correlated by the Illuminating Engineering Society, which serves as a centre of many varied activities. There is no reason why we in this country should not do equally well by similar methods. Although supply undertakings are individually hampered by legislative difficulties, they could, by combined effort, do a great deal to improve the situation. Again, believing as we do that the electrical industry will get the full benefit of broadly-conceived schemes of educating the public in lighting matters, we think that it would be foolish for them to be deterred from joining in a scheme merely because other illuminants are represented. The truth is that lighting is, or should be, of interest to all sections of the community, and the community, as a mass, can only be approached successfully on very broad lines. This, it is evident, is recognised in the United States, and we hope that the Illuminating Engineering Society in this country will receive similar substantial support in its endeavours to reach the public ear.

The German Electrical Industry.

A recent German report indicates that the unfavourable course of trade generally in that country exercises a prejudicial influence on the electrical industry. It is stated that if the large works in non-occupied territory have not yet had to make such restrictions in working as have been necessary in the metal and machinery industry, this is attributable partly to the existence of good relations and associations with works abroad. It is impossible to send electrical products into occupied districts, as the entrance dues, which have to be paid to the Allied Mission of Works Control, often amount to 50 per cent. of the value. The branches in occupied territory of the large works in Berlin and Saxony are nearly at a standstill, as they are receiving only small orders which are insufficient to pay the wages and salaries of the erectors and the staff. Under normal conditions of the mines and industries in occupied districts, the branches were usually well occupied with the remunerative work of repair and the replacement of parts: there were, in addition, the sales of power plants and small electrical manufactures. All this business has fallen off. The small and medium-sized electrical works share the few orders which are placed by the local trades, which are almost at a standstill. Moreover, the call for electrical articles from retail buyers is very small, owing to the scarcity of money. The large electricity supply works stand alone in being in a good position because, despite the difficult situation, they are compelled to extend their cables.

The position in non-occupied Germany is not quite so unfavourable, and the lamp season is now affording some compensation for scarcity of orders in other directions. Inquiries are being received from abroad for cables, motors, turbines, and other large machines, and among the resulting orders have been some for cables for South America, while orders have also been received from Japan in connection with the work of restoration after the earthquake.

It is too early to judge what will be the influence of the signing of the Agreement last Saturday on the position of the German electrical industry and trade. The foregoing notes reflect the situation as it was prior to that important event.

German Railway Electrification.

In our leading article of August 1st on "Industrial Germany," we briefly mentioned that railway electrification did not appear to have made much progress in that country, but that it remained to be seen whether greater progress would be made now that all the railways in the different Federal States had been amalgamated. Such development as has taken place so far is the result of the activity of the States in their individual capacity. In this connection it is recalled in the report of Commercial Secretary Thelwall that the Bavarian Ministry for the Interior estimated in 1921 that out of the available water power in use in 1925, 220,000,000 kW-hours per annum would be required for operating railways in this State, and that by the time the total water power has been developed the share of the railways in the consumption will be 1,300,000,000 kW-hours. So far, however, only two small sections of the Bavarian railways—one between Reichenhall and Berchtesgaden and the other between Mittenwald, Garnisch and Griesen—are operated by electricity; but work on the transformation from steam to electric traction has begun on a number of other lines. In Saxony the Leipsig-Magdeburg line of a length of 110 miles has been converted to electrical working and two other conversions of lines are held in prospect, but no information with regard to work in the same direction in Prussia is forthcoming.

Municipal Administration and Private Interests.

All who are interested in the maintenance of a high standard in our public life will welcome the decision arrived at by Mr. Justice Bailhache in the case of Lapish *v.* Braithwaite, and will note with satisfaction that that decision has attracted attention in other municipal circles besides Leeds. The question is one that has not been raised so frequently in recent years as was formely the case—possibly because there has been a more general recognition of the importance of men who fill public places being entirely above suspicion in respect of contract matters. The question raised in the Leeds case was whether an alderman of a City Council was disqualified from acting as alderman by the fact that companies in which he was interested had effective contracts with the Corporation of which he was an alderman. The judge held that the defendant in the case came within Section 12, Sub-section 1 (*c*) of the Municipal Corporations Act, 1882. He was managing director of the company mentioned in the case, not merely a shareholder. An echo of the case is heard from Leigh, and is recorded in our "Business Notices" to-day, while legal proceedings are threatened against nine members of the Nottingham Corporation on the ground that they are associated with companies that have business dealings with the Corporation. It will be recognised that it is most necessary to have business men of outstanding ability in our public life, and those who are successful in the one sphere are needed in the other, but somehow that desirable end must be secured without there being room for suspicion that personal interests influence men in matters of public policy.

Mica and Micanite Insulation—IV.

By ARCHIBALD A. C. DICKSON.

From the numerous inquiries that I have received asking me to explain some terms used in my first and second articles* on this important subject, particularly with regard to "biotite" and the "optic axial plane," "optic axial angle," &c., used in connection with the various micas, I gather that very little information on this subject is available to the majority of the consumers, and consequently I gladly give herein, for their help, the necessary information or explanations in as simple language as possible. I would have given these explanations before, but I took it for granted that these terms were known to everybody who had anything to do with mica.

With regard to the family group of the "Biotite," in my first article I treated it in a manner best understood by the mica dealers and consumers, and in referring to it as the so-called "black amber," I pointed out that it contained 15 per cent. of iron in its mineralogical composition, whereas in my second article I showed that, according to chemical analysis, the black-looking phlogopite (amber) only contained 5.8 per cent. of iron. This first marked difference shows that though some mineralogists have grouped "biotite" as a "phlogopite" of almost the same appearance in thick sheets, the "biotite" is different, in this essential feature, and is not applicable to the same use as the real black-looking "phlogopite."

In my second article I gave briefly technical details to show that, from the utilitarian point of view, the present-day mineralogists favour the older classification or family grouping by "Dana," as it more clearly conveys an idea of the optical, physical, and thermal properties of each distinctive group, which is so essential to selection for the varied uses by the electrical industry.

Having disposed of the "biotite" group, I shall now go on to explain the "optical" terms used.

(1) *The Optical Axis.*—Mica exhibits *double refraction*, but there are one or two directions in which double refraction does not occur. This single refraction part is called the "optical axis."

(2) *Double Refraction.*—If a clear piece of "Iceland spar" (calcite) is placed on printed matter, it makes the letters appear double—hence the term *double refraction*. The latter term (refraction) means the change in the direction of a ray of light when it enters obliquely a medium of a different density from that through which it has previously passed. Mica is one of the many minerals that have this double refraction, but it does not show it so pronouncedly; still, if mica is examined properly, this property can be detected.

(3) *The Axial Angle.*—The angle enclosed by the two optical axes is known as the "axial angle." This angle varies with the different groups of mica, and appears to show some relation to the chemical or mineralogical composition of the family groups.

(4) *The Axial Plane.*—Mica is a double-optical-axis crystal. The plane formed by the two axes is called "the axial plane."

In muscovites this plane is perpendicular to the *plane of symmetry*, but in phlogopites this plane is parallel to the planes of symmetry.

(5) *Plane of Symmetry.*—The crystal outlines of mica are not always visible, more generally they are not exhibited in ordinary specimens.

After Holland. In such cases the direction of the so-called plane of symmetry can be determined by producing a percussion figure. For this purpose a thin mica plate is placed on a sheet of cardboard, or a similar firm plane surface, and is then struck a sharp blow with a blunt needle point. A six-rayed star is produced in this way, the cracks intersecting at the centre of percussion at angles of 60 degrees approximately. The ray which lies nearly parallel to the plane of symmetry is spoken of as the characteristic, or leading, ray, which often is the only clearly visible ray exhibited, and this ray in the muscovites lies at right angles to the plane of the "optical axis," whilst in the phlogopites it lies nearly parallel to that plane. (See figs. 1 and 2.)

These optical properties are well worth studying very carefully. As was indirectly pointed out in my earlier articles, they offer a ready means of easily testing the mica one is offered, to see if it is a muscovite or a phlogopite, and further to ascertain if the seller actually knows what he is offering.

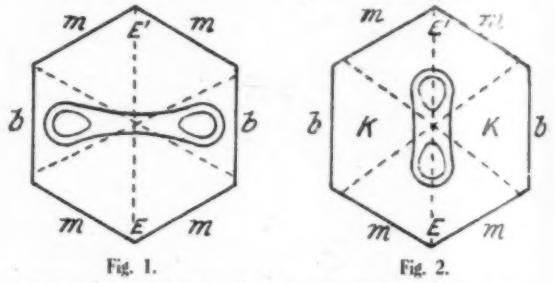

Fig. 1. Fig. 2.

m, traces of the prism faces; b, traces of the clinopinacoid or plane of symmetry, or its equivalent; E E', leading line of the percussion figure.

We will now turn our attention to the manufacture of the various mica goods so largely used for insulating electrical apparatus.

Brown Moulding Micanite.

Some of the electrical firms of the United Kingdom specify, when buying outside, that the brown moulding micanite should contain 10 per cent. to 15 per cent. varnish. This is not a happy choice, as my own researches and long experience, and the practices of the most particular and reliable manufacturing electrical engineers the world over, have proved that 20 per cent. to 25 per cent. is best suited to this class of micanite to allow easy flow of the melted varnish, which permits easy and free slipping or moving of the splittings over one another to more readily take the *exact* shape of the mould, when moulding, without any fear of the breaking of the moulded insulator or the loosening or opening out of the stuck splittings, due to insufficient adhesive. If this were standardised, it would generally simplify manufacture, as will be shown below.

As such a large percentage of varnish is used in the manufacture of this class of micanite, I must again emphasise the paramount importance of very carefully testing the varnish and the shellac used in its composition. I have already pointed out the drawbacks of resin or colophony—the non-volatile portion of the oleoresinous exudation of the pine—which is used so largely for the manufacture of a cheap and low-grade varnish, and is further very commonly mixed with shellac to cheapen the cost of the shellac spirit varnish generally used as an insulator and for making "brown moulding micanite" and "commutator micanite." A fairly pure shellac, the purest on the London market, sells at about £14 15s. per cwt. (112 lb.), while a good resin or colophony sells at about 18s. per cwt. Therefore, in addition to the qualitative test for shellac and resin or colophony given in my second article on mica and micanite insulation, I now give a quantitative test which can be made easily by determining the iodine value of the mixture sold as shellac. Shellac stands alone among the resins in its low iodine absorption. Resin or colophony has, on the other hand, an uncom-

* Earlier instalments of this series appeared in our issues of November 16th, 1923 (p. 749), March 14th, (p. 408), March 21st (p. 469), and May 2nd, 1924 (p. 688).

monly high absorption. For this quantitative determination of resin or colophony in shellac we again turn to Parry, for the English method, who says: "Shellac forms a combination with iodine to the extent of, on the average, 9 per cent. of its own weight, whilst resin or colophony combines in a similar manner with 125 per cent. of its own weight. By a careful determination of the amount of iodine with which a given sample will combine, it is easy to calculate, from the above figures, the percentage of the two ingredients present."

Against this, the Continentals say that the average number of tests on light-coloured resins shows 228 absorption for resin, but for the dark-colour resins or colophonies below 200, and these dark-coloured resins are used in adulteration. According to Langmuir, commercial shellacs showed between 15.8 and 33.9 iodine absorption. For tests, Wijs' solution of iodine is used in preference to Hübls' solution. McIntosh's formula for the actual test on this basis is as follows:—

If y = per cent. resin or colophony, M = iodine number of shellac, N = iodine number of resin or colophony, A = iodine number of mixture—

Then $y = 100\ (A - M)/(N - M)$.

Taking the iodine values of shellac and resin at 18 and 228 respectively, we have, in the case of a T N shellac giving a number 33.9—

Per cent. of resin $= 100\ (33.9 - 18)/(228 - 18) = 7.6$.

As a different solution is used on the Continent, this iodine (solution) absorption is raised proportionately for both the shellac and the resin, and from a number of tests of the different classes of shellac on the market a table showing numbers representing iodine absorption of the various mixtures sold as shellac and the different lacs has been prepared for use with the above tests.

It must not be forgotten that a pure shellac can be pared with a knife without splintering. When crunched between the fingers and palms of the hands, adulterated shellac breaks readily into tiny pieces.

It is this resin or colophony adulteration that is more particularly responsible for all the trouble in insulation where so-called shellac varnishes are used. The green discoloration so frequently seen on armature and field windings can be more particularly attributed to the resin or colophony adulteration of the shellac than to the shellac itself used in making the varnish. This heavy adulteration of shellac also usually gives the brown moulding micanite a darker hue and sometimes a red tinge, and makes the micanite brittle and less able to stand the usual vibrations of the apparatus where it is used; it makes it more difficult to cut, saw, drill, or punch, and the micanite usually more easily exfoliates, breaks, and leads to unusual waste, so that an apparently cheap brown moulding micanite (apart from other drawbacks that will be pointed out later on) is ultimately, in reality, a very expensive micanite which is further likely to get for a good firm using it so bad a name in the market that they may be put to considerable expense thereafter to try and rebuild their reputation for reliability. It must never be forgotten that in a moulding micanite the difficulties to be overcome are mainly of a mechanical nature: mechanical strength with a certain amount of give or flexibility of the binder on being strained, without fear of trituration, is more essential than even dielectric strength.

As this class of micanite is used in all thicknesses from, say, 0.006 in. up to 0.75 in., it will be seen that it allows, in the thicker sheets, a wide scope for the adulterator who may desire to show that his goods are cheaper than those of his competitors. Apart from the above adulteration of the varnish, it is not an uncommon practice to use a fairly good splitting top and bottom of a plate of micanite and to fill the whole of the inside with small cheap splittings, and also, sometimes, cuttings and waste from other jobs. If a man uses a two-layer top and bottom good splittings at, say, eightpence a pound, and he makes sheets 40 in. by 40 in. by $\frac{1}{4}$ in. thick, he will use roughly 1 lb. 8 oz. of the good splittings costing 1s. the lot, and 13 lb. 8 oz. of inferior splittings at, say, fourpence a pound, or costing 4s. 6d. the lot; he will further use 5 lb. or, say, nearly a gallon of varnish at, say, 12s. 6d. per gallon, and thus his materials will cost 18s. the lot, yielding 20 lb. micanite, or the cost per lb. will be, for materials alone, just below 1s. per lb. A girl can make from 16 to 20 lb. of micanite in a working day. Baking and pressing, where necessary, does not cost much.

In contradistinction to this, we take the case of a first-class, reliable moulding micanite of uniform quality throughout, using a purer shellac varnish. We have 15 lb. of mica splittings at eightpence a pound, or 10s. the lot, and a gallon of purer shellac varnish at 20s., so that the material alone here costs 1s. 6d. per lb.

As I have pointed out elsewhere, to get the best results all round we must, of necessity, go to the cheapest and yet most reliable sources for our raw materials. The splittings and shellac are about 50 per cent. cheaper in India, and the denatured spirit used in the manufacture is about 25 per cent. cheaper, while labour, with proper supervision and handling, can be made as efficient as this class of labour here, and then the cost, including supervision, provided work is intensive, should be about one-sixth the cost of labour here. This ground work manufacture of the standard thin sheets has on account of this been recommended by me for manufacture in India, not only for cheapness, but also for the simple reason that a finer selection of raw materials can be had, and consequently a far superior and an absolutely reliable quality of this recommended standardised groundwork micanite may be brought over and passed through the usual channels, and this will relieve much stress and improve the quality of the goods made from brown moulding micanite, whether they be thicker sheets, mouldings, bushes, tubes, or rings, &c. Though there may be opposition to this, as there is opposition to all innovations, it would benefit all interests, while the central clearing house, responsible to the electrical industry, would do all the selecting, testing, checking, and seeing to the individual wants of each consumer, which could be thus supplied at the shortest notice.

Once the varnish is tested and the splittings are selected and both are standardised, the manufacture is a simple process. The building-up of the sheets is done on the same principle as that employed in building up the commutator micanite sheets as described in my second article on this subject.

The shellac varnish used is more dense than that used for making commutator micanite.

The best way, particularly for India, to do this ground-work manufacture is to standardise the density of the varnish first, then to weigh a lot of splittings of a standard size, say, one pound, and give it out for each table, on which the building-up of the sheets is done, where 40 in. by 40 in. sheets are made. Let the girls build it up on the following lines:—Lay splittings, spray or spread varnish (but not too thick)—the girls get expert at this with a little practice—and continue building until all the splittings are finished, when the sheet should be weighed to ascertain the exact percentage of varnish used. This is then standardised as a ground-work, and these sheets are carried on their oiled leatheroid base to the hot plates where they are dried to dispel all excess spirit and remove the viscidity; they are then gauged to ascertain the thickness of the sheets, after which they are stacked in shelves marked with the dimensions and thickness of the sheets. If this basis of ground-work manufacture were insisted on by the whole of the electrical industry, the quality of the moulding micanite would automatically improve, as it would be difficult to hide excessive adulteration, while this standard size and thickness would answer a host of purposes, such as strips for making "V" rings, channels, slot linings, and building up small sections. Certain classes of tubes can also be made from these. Where the thicker sheets are required, it merely means multiples of these thin sheets being stuck individually to one another. An allowance of 5 per cent. is made for shrinkage in the pressing process when pressing a number of these thin sheets to make thicker sheets. The pressing itself, as far as these thicker sheets are

concerned, is done by means of a steam-heated press; according to the best practice, stop-gaps are used in between, but around the edges of, the platens to check undue pressure and to ensure uniformity of thickness. The press is heated to 120-130 deg. when the sheet, built up to a thickness 5 per cent. above the required thickness, is placed between two sheets of oiled paper and the whole plate with the paper covers is put between two oiled or soft-soaped steel plates, bodily inserted between the press platens and left for 12 to 15 minutes to soften. The press is lowered to meet the stop-gaps, and a pressure of 500 lb. per sq. in. is applied; at the same time the steam is cut off and cold water is allowed to circulate freely through the platens of the press until the sheet is absolutely cold and hard, when the press is raised and the sheet is extracted and stocked away according to its standard. This building-up is far superior to the whole thick sheet building-up for reasons already given. This class of built-up thick sheets is better sawed by band saws and then smoothed round the sawn edges by emery cloth to get the best finish. Almost any required shape can be cut by these saws. Such moulding micanite also has greater mechanical strength than a lot of the present-day material on the market that is being sold as good quality brown moulding micanite. For this class of micanite a good No. 6 splitting, 1 sq. in. to just below 2½ sq. in., should be used throughout the body of the sheets, and the shellac varnish should not contain excess of resin; 5 per cent. to 7½ per cent. is usually contained by the best commercial shellac on the London market.

Quite recently research has led the way to build up this moulding micanite by using a varnish made of dammar resin dissolved in turpentine and treating the splittings on much the same lines as described above. A purer, heat-resisting, non-hygroscopic, mechanically stronger and more lasting material is claimed, but I am not prepared to vouch for all these claims just at present, even though I have had many good results, in different tests, from this particular varnish, which is easy to make. At the same time, it must not be forgotten that much depends upon the quality of the dammar resin used. The melting points of the dammar resins range from 85 deg. C. up to 200 deg. C. Owing to ignorance on this point and the general belief that all dammar resins are soft and have a low melting point, these resins have not had the attention they deserve. Of course, another reason is the pushing forward and booming of the synthetic resins, which is responsible for side-tracking not only these dammar resins but also the copals. I might mention that a good copal resin has a melting point of 305 deg. C. or 581 deg. F., so that it may be found, after careful research, that the natural resins contain properties not looked for in them before.

(To be continued.)

The Costing of Winding and Insulating Coils.—II.

By F. C. LAWRENCE, M.C., B.Sc.Tech., A.M.I.E.E., A.C.W.A., Chartered Electrical Engineer.

The Mica Varnish Products.

The variety of mica varnish products made will, of course, depend upon the design of the machinery or the demand. It is supposed that there are about a dozen types, among them being mica and silk tape, mica and paper tape, micanite paper sheets, commutator ring sheets, mica empire cloth, mica sheaths and corner pieces, meter coil bobbins, Haefely wrapping machine rolls and varnished paper cylinders. Neglecting, for the moment, the last two, the materials required will be sheilac varnish of various densities and several other kinds of varnish, mica of three or four grades, silk, cambric, paper of two or three kinds, empire cloth and glue, most of which are comparatively expensive and call for considerable care in handling, if manufacture is to be carried out economically. It is necessary to protect the issues of these materials from loss or pilferage, and to institute some means of charging them out to processes or jobs.

The manufacture of these products is best treated as a number of processes, the costing of which should be carried out in the manner which has been outlined for process costing.

It is advisable with so many processes which require the same kind of material, to facilitate the booking of the materials to the processes by establishing an issuing sub-store or table, equipped with an indicating weighing machine, yard measure and some varnish measures, and to arrange that all material must pass through the hands of the sub-storekeeper, who will replenish the bulk supplies from the main stores.

The cost clerk who deals with this section will then have available complete data of the issues of the materials to the processes and will be able to determine the material cost of each process each period.

If it is arranged that the finished goods are returned to the storekeeper, he is also able to make a schedule of output of product for the cost clerk, by means of which

Materials Issued. Week 16/24 Process No. 3

For the manufacture of Mica and Silk Tape.

No.	Material.	Quality.	Unit.	Specified† Quantity.	Issued Quantity.	Work in progress.*	Net Quantity.	Product. Charged Out.	Stock.
	Mica ...	G	lb.	40	47	6	41		
	Varnish ...	X 1.	gall.	6	8	1½	6½	56 lb.	10 lb.
	Silk ...	Jap	yard.	31	35	4	31		

* Extra columns may be inserted here for unit price and cost.

† Calculated from estimated output.

Fig. 1.—Process Issue and Product Note.

the cost of the material per unit output of each process can be established.

At the end of each period there will be a certain small amount of material—mica, paper, varnish, &c., and part finished goods, either on the work benches or in the sub-stores, and these must be taken into account. They represent the work in progress, and it should be the duty of the storekeeper to measure the quantities and enter them on his schedule during the clearing up interval on the last day of the period. The cost clerk should be in attendance to check this stocktaking.

To make this clear, figures 1 and 2 have been completed with values, for several materials.

Figure 1 shows the quantities actually used during the week for process No. 3. Thus 47 lb. of G quality mica and eight gallons of X1 varnish have been issued to the process. These two quantities appear under process No. 3, on figure 2, in the columns "Quantities issued to work in progress." The analysis contained in these columns includes issues to all other processes, and shows a total issue of 322 lb. of mica, whereas the net quantity used (see fig. 2), according to the requisitions on the main stores and the stock should have been 327 lb.—indicating a shrinkage of 5 lb. In the case of X1 varnish 42 gallons have been used, whereas 42½ should be accounted for—½ gallon error.

Summary of Material Requisitions. Week ending 16/24 Section Mica Varnish.

Material.	Quality.	Unit.	Stock at beginning of Period.	Withdrawals from Main Stores as per requisitions.	Stock at end of Period.	Net Quantity used.	* Quantities issued to Work in progress. Processes.							
							1	2	3	4	5	6	7	Total.
Mica	G	lb.	64	412	149	327	23	121	47	34	17	12	78	322
Varnish	X1	gall.	5	45	7½	42½	5		8				29	42
Varnish	V2	gall.	0	40	4	36		27		7		2		36

* Extra columns may be used to show waste and cost of waste.

Fig. 2.—Material Requisitioned compared with Material Issued.

The remarks column is provided for the notification of changes in prices of material, rates of wages and overhead, and other explanations which may be necessary to prevent misleading comparisons being made.

The primary purpose for which the unit cost is obtained is for the charging out of the material turned into stock or manufactured as parts of other products. Each batch of goods delivered will be, in the normal routine, accompanied by a dispatch or shipping note, which will give particulars of the quality and quantity delivered.

Cost of Finished Parts. Made in Dept.

Description Process or Finished Style No.

Size

Week or Period of weeks.	Quantity Made.	Factory Cost per				Remarks.
		Labour.	Overhead Expenses.	Material.	Total.	

Fig. 3.—Form for Recording the Cost of Finished Parts.

If this varnish cost 6s. per gallon, the value drawn from stores and issued would be:—

42½ gallons at 6s.	£12	15 0
and that used in the processes—		
42 gallons at 6s.	£12	12 0
Leaving		3 0

not charged to the cost of processes, but representing the wastage incurred in issuing such small quantities. Such deficits should be transferred to a wastage account and dealt with as described later.

The system adopted for costing material, at once suggests a method suitable for the labour. Job tickets or their equivalent should be filled in for every worker, charging their time, not to the orders for which the materials are being made, but merely to the various processes (one ticket each employé each week for each process) thereby reducing the number of entries and tickets to practicable dimensions, and giving all necessary details, whereby the wages can be calculated and paid, and the cost transferred to the respective processes.

This system of process costing will be found to give quite accurate costs, with no undue amount of clerical labour, and will ensure that a useful control is kept over material issues and labour cost, whilst the entries for succeeding periods, on the card shown in fig. 3, will make possible those comparisons which are an invaluable factor in the controlling of efficient manufacture.

These notes will pass into the hands of the cost clerk, who, after he has derived the unit cost of each process (at the end of the period) will be able to enter the unit cost on the shipping note and extend the total charge, represented by each delivery; by this means the work in progress account of the insulating department is relieved of the cost of finished goods, and the work in progress accounts of the main assembly departments charged with the goods received by them. From these shipping notes, the cost account of any particular order may be charged with the value of insulating material used on the job.

The procedure outlined may be modified, if the period, over which costs are taken, is of such a length that the

variations in the value of the work in progress is negligible in comparison with the value of the output; in this case no account of stock need be taken, and the calculations are thereby somewhat simplified, but such a modification can only be justified by taking out the actual figures, so as to indicate the error introduced, and by making sure that neglecting the stock does not cause an error of more than, say, ½ per cent. in the final cost figures.

For instance, if the value of mica used is of the order of £1,000 per week and the stock is controlled so that it varies only between £50 and £55 in value, the maximum difference in stock throughout a period cannot exceed £5 which is only ½ per cent. of the total value of mica used.

If the same degree of control is adopted for all materials, the cost of material charged to any one order cannot be more than ½ per cent. different from the true value, and considerable time, spent in taking stock each month, may be saved.

London Electric Railway Extensions.

The Hendon-Edgware Extension: First Railway Automatic Sub-station.

THE extension of the Hampstead line of the London Electric Railways from Golder's Green to Edgware forms part of the scheme of improvement in progress on the Underground system, the total cost of which will be £12,500,000. The chief features are the entire reconstruction of the City and South London Railway (now nearly completed) and the extension of this line from Clapham Common to Morden (under construction); the extension of the Hampstead line to Edgware on the North and to Kennington on the South; and the Camden Town junction (opened on April 20th last; see ELEC. REV., May 16th, 1924) which connects the City and South London and the Hampstead lines and permits of through working between the two railways.

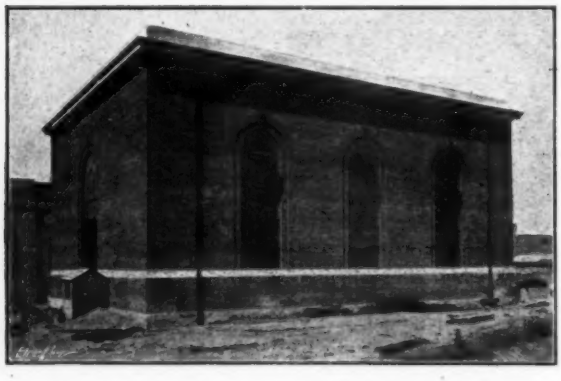

Fig. 1.—Exterior of Burnt Oak Sub-station.

The first section of the new line, between Golder's Green and Hendon (Central) stations, with an intermediate station at Brent, was begun in June, 1922, and opened for traffic in November, 1923. Construction of the Hendon-Edgware section, which has a length of three miles, was begun in November, 1922, and the line was opened on August 18th, 1924. From Hendon (Central) station the line is continued in a north-westerly direction, passing under the Burroughs ridge and the Midland main line of the L.M.S.R. by means of twin tunnels and thence running on the surface in shallow cuttings and on low embankments. The Burroughs tunnels are of standard Tube type, with an internal diameter of 11 ft. 8¼ in.; they are 5 furlongs in length and have a fall of 50 ft. The depth below surface varies from 70 ft. to about 13 ft. Between the tunnels and the Edgware terminus the line passes under or over ten bridges; in addition, two brick footbridges have been constructed.

The permanent way is of standard rails spring-keyed to chairs bolted to sleepers with contact rails carried on Siluminite insulators. All cables are suspended on concrete posts alongside the track. The signalling is all electric. The line is provided throughout with a track circuit, the signals adopted being of the daylight colour type, giving the same indication by day as by night; with the exception of those controlled from signal cabins, all signals work automatically. All points are operated by a.c. all-electric point machines. Telephones are furnished at all home signals, so that motormen can communicate with the signal cabin, if necessary. An emergency telephone warning scheme is installed in the Burroughs tunnels, in connection with which all motormen are provided with portable telephone instruments. The rolling stock was built expressly for the extended Hampstead line and the reconstructed City and South London Railway.

One of the most interesting features of the extension is the sub-station, which supplies power for operating the trains. It is not only the largest automatic sub-station in Great Britain, but also the first to be installed for electric traction purposes.

The sub-station building, shown in fig. 1, has been designed to accommodate three 1,200-kW rotary converters with their control gear and accessories, two of which are in operation. The complete plant has been designed, manufactured, and installed by the British Thomson-Houston Co., Ltd., of Rugby, with the exception of the main and auxiliary transformers; the former were supplied by the Metropolitan-Vickers Electrical Co., Ltd., and the latter by the Brush Electrical Engineering Co., Ltd. An interior view of part of the sub-station is given in fig. 2.

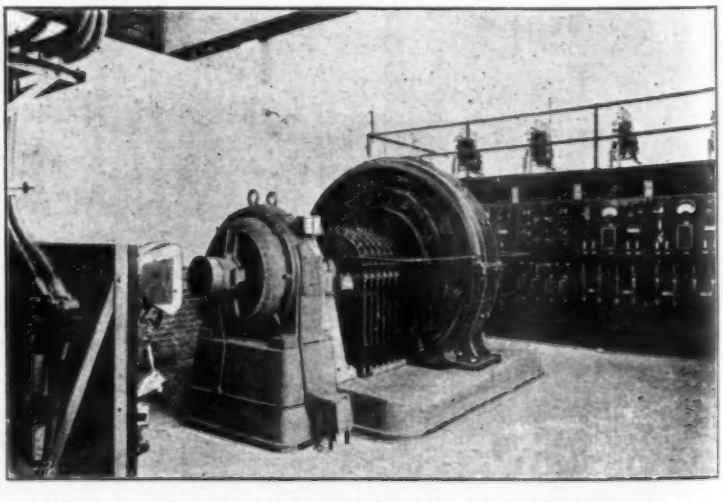

Fig. 2.—1,200-kW Rotary Converter, with Track Feeder Board in Background.

A three-phase high-pressure supply at 10,500 volts, 33⅓ cycles, is provided from the Railway Company's power station at Lots Road, Chelsea, to the new sub-station, which is situated at Burnt Oak, about one mile from the Edgware terminus and four miles from the nearest manually operated sub-station (at Golder's Green). The high-pressure supply reaches Burnt Oak sub-station by means of two three-core cables from Golder's Green sub-station, where control is effected by manually operated oil circuit breakers.

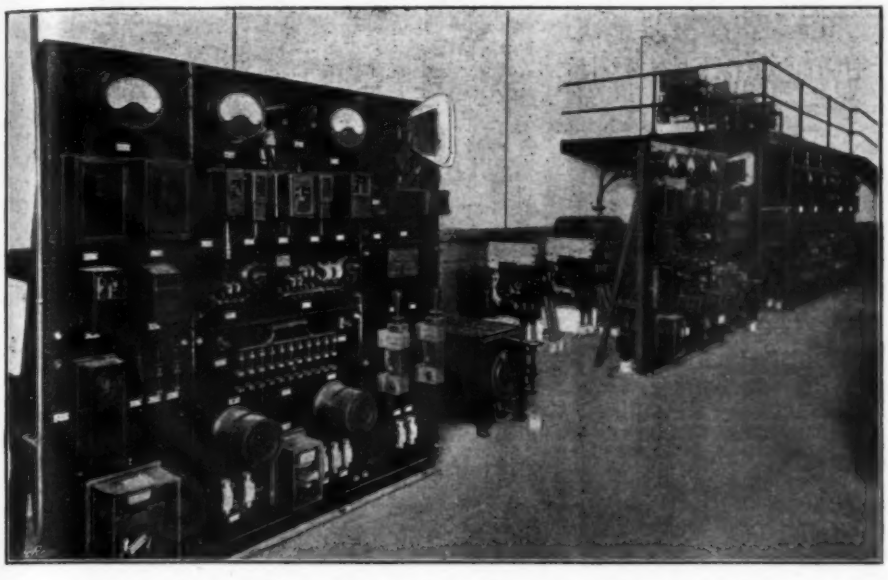

Fig. 3.—General View of d.c. Switchgear, showing the two Machine and Relay Panels and the Track Feeder Board.

The only high-pressure switchgear at Burnt Oak consists of change-over isolating switches so arranged that, for normal operation, each rotary is connected to a separate feeder. Upon the closing of a feeder oil circuit-breaker at Golder's Green, the rotary to which it is connected at Burnt Oak starts up automatically and takes load, subsequently being entirely under the control of the automatic gear.

Five brick and stone cubicles of the London Electric Railway Company's standard type house the high-pressure busbars, to which the two incoming feeders are connected through single-pole isolating switches. The busbars are in two sections, change-over isolating switches being provided so that either rotary can be operated from either feeder, or in the event of a breakdown of one feeder, both machines can be operated from the sound feeder.

There are two banks of three 440-kVA single-phase air-blast transformers, delta-connected on the high-pressure side, and double delta on the low-pressure side. Cooling air for each bank is supplied by a centrifugal blower driven by a squirrel-cage induction motor, which also drives the small auxiliary generator which is used to fix the polarity of the rotary at starting. A small single-phase transformer gives a low-pressure supply for the control circuits, and this, together with the blower motor, is connected directly to the low-pressure side of the main transformers.

In front of each bank of transformers is the automatic starting panel, of polished slate with angle iron supports, which carries, in addition to the starting and running contactors, three small contactors for controlling the fields of the rotary and auxiliary generator.

Each rotary converter is rated at 1,200 kW, 500 r.p.m., 600/630 volts; is compound wound, and is equipped with a self-synchronising starting motor and over-speed device. It differs from a manually operated machine in being provided with an auxiliary field winding to determine the polarity, and to afford protection against bearing overheating, starting motor overheating, and leakage to earth. The bearings are fitted with flood lubrication in addition to the usual oil rings, the oil being supplied to the bearings from a storage tank in the basement by a small gear-type pump driven by a squirrel-cage induction motor connected in parallel with the blower motor.

The d.c. switchgear comprises two machine panels and a feeder board, of polished slate mounted on angle iron. Each machine panel carries an ammeter, voltmeter, reactive volt-ampere indicator, and a.c. and d.c. watthour meters, together with the relays required for controlling and protecting the machine, and standard lever type isolating switches. A multiple change-over switch and three small control switches are also provided to enable the machine to be operated manually if desired.

The feeder board controls four circuits, and in view of the fact that an insulated return rail is used, circuit breakers are provided on both poles.

All the d.c. circuit breakers are of the high-speed type, and are mounted on the floor behind the panels.

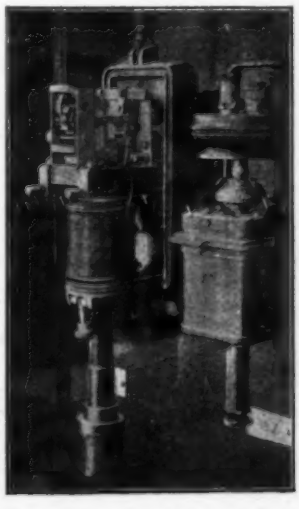

Fig. 4.—Part of Machine and Relay Panels, showing the Repeat Action Relay and Time Delay Relay.

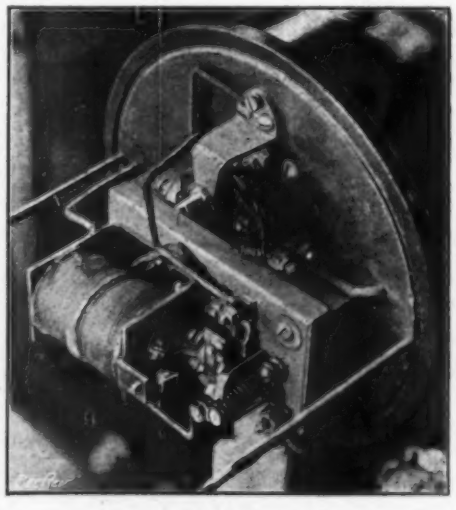

Fig. 5.—Machine Temperature Relay.

In the case of the feeder board, a gallery is provided to carry some of the breakers. A general view of the d.c. switchgear is shown in fig. 3, and the arrangement of the feeder board can be clearly seen from fig. 2, which also shows one of the rotary converters.

When it is required to start up a rotary converter at Burnt Oak, the attendant at Golder's Green closes the appropriate high-pressure feeder circuit breaker, thus giving a high-pressure supply to Burnt Oak. This

energises the main transformers, which in turn energise the control transformer, the blower motor, and the oil pump motor. The two motors start up, but before any further operations can take place, the auxiliary generator attached to the blower motor must build up its voltage. As soon as this happens (indicating that the blower is up to speed and the transformers are receiving a supply of cooling air), the rotary may start. A master control contactor now closes, makes alive the control busbars and sets in motion the motor-operated master controller, which closes the starting contactor, thus connecting the starting motor to the transformer. The rotary therefore starts up. At the same time, the auxiliary field winding of the rotary is connected to the auxiliary generator, thus ensuring that the machine will build up the correct polarity, and the main field winding is connected to a tapping on the field rheostat, so as to give the correct field strength for synchronising.

At this point the controller stops and waits for the machine to synchronise. When the rotary is in synchronism, the controller is restarted by a synchronous speed-indicating relay, and closes the running contactors, thus short-circuiting the starting motor and connecting the converter direct to the transformer.

The controller, continuing its travel, now opens the starting contactor, changes over the main field of the rotary from the tapping previously mentioned to the field rheostat arm, and disconnects the auxiliary field winding from the auxiliary generator. The field rheostat arm is left normally in the position which gives full voltage on the rotary, but provides a means for raising or lowering the machine voltage, should occasion arise.

It will be noted that the machine is not yet connected to the d.c. bars, and there is therefore no possibility of the polarity of the auxiliary generator being reversed by short circuits or heavy overloads which may react on the auxiliary field winding of the rotary.

Further motion of the controller closes the machine line contactor and high-speed circuit breaker, and the rotary picks up its load. At this point the controller again stops, and remains stationary so long as the rotary is in operation.

The feeder breakers close automatically as soon as the busbars are energised. As, however, it may sometimes be desirable to feed through the sub-station to the Burnt Oak-Edgware section of the track, without running up a rotary at Burnt Oak, the two feeder circuit breakers supplying the Burnt Oak-Golder's Green section are arranged to close either from track voltage or busbar voltage, whichever appears first. Once these two breakers are closed, the Burnt Oak busbars are of course made alive through them, and the remaining circuit breakers close automatically from the busbar voltage.

To shut down the machine, the high-pressure feeder circuit breaker at Golder's Green is opened. This de-energises the main transformers, with the result that the master control contactor opens and the machine shuts down, the master controller returning automatically to the "off" position in readiness for the next start. Each machine is fully protected; fig. 4 shows the repeat-action and time-delay relays, controlling the machine high-speed circuit breaker, while fig. 5 is a view of the machine temperature relay. The method of protection used by the B.T.-H. Co. will be described in a later issue.

A car shed has been built at Edgware, and the new stations are of novel design so far as local railway stations are concerned.

The Greenock Corporation Waste Heat Installation.

A Sugar Refinery Steam Plant.

By WILLIAM HALL.

A good example of waste heat utilisation is to be found in the steam plant now in commission at the Glebe Sugar Refinery, Greenock. Although, whenever possible, electricity was used throughout for power purposes, at the same time a large amount of steam was also required for the different processes connected with the refining of sugar. The electricity was supplied by the Greenock Corporation, and the load on the feeders approached at times 350 kW. Steam was generated by boilers, at a pressure of 220 lb. per sq. in., which was reduced by valves to 80 and 25 lb. per sq. in. for use in the refinery.

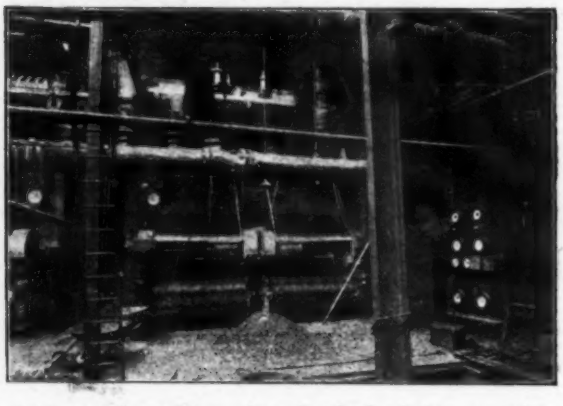

Fig. 1.—One of the Boilers.

The proprietors of the refinery decided, however, that an advantage would be obtained if they installed reducing pressure engines to generate their own electricity, and as such engines took only five per cent. (approximately) of the heat value out of the steam, the latter could then be passed on for process work in the refinery. The Greenock Corporation had always favoured any scheme for the utilisation of waste or surplus energy for the generation of electricity for the town supply. It

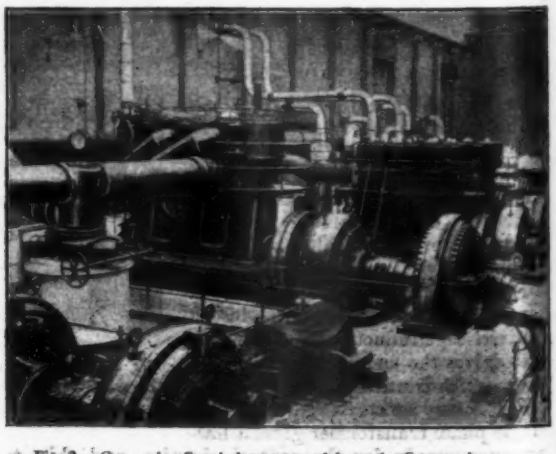

Fig. 2.—Generating Sets before removal from the Corporation Electricity Works.

was among the first to install a destructor for raising steam at the power station from town refuse, and had also two small water-power installations feeding into the mains. The Corporation, therefore, indicated its desire to co-operate with the refinery in order to obtain any surplus energy available for the town supply.

An agreement was finally drawn up between the parties in July, 1922, under which the company agreed to provide suitable accommodation for the generating plant that the Corporation agreed to erect free of all cost to the company; this plant included all piping and valves for connecting the new plant with the company's boilers. Thus the refinery has the advantage of a "stand-by" supply from the Corporation, while the Corporation benefits by the supply of an agreed number of kWh generated by the refinery.

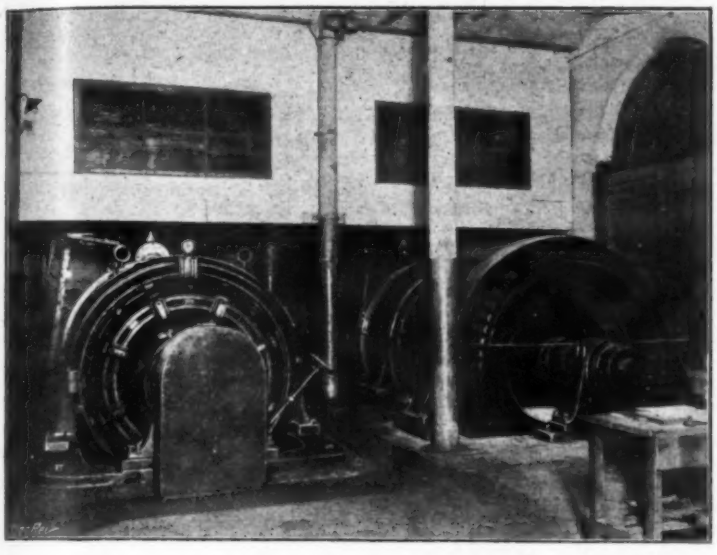

Fig. 3.—Generators and Asbestos Screen.

In the boiler house are four Stirling water-tube boilers, fig. 1, each of a capacity of 35,000 lb. per hour, at a pressure of 220 lb. per sq. in. and superheated to 630 deg. F. The steam rises through a 7-in. diameter header from each boiler and is led to a 14-in. receiver; at each end of the latter there is fitted a surplus reducer valve, one reducing the pressure to 80 lb. per sq. in. for supplying steam to the pumping engines throughout the refinery, whilst the other reduces the pressure to 25 lb. per sq. in. for heating the pans.

The main steam is used to drive two Belliss & Morcom triple-expansion engines, each of about 800 h.p., coupled directly to generators. The engines were transferred from the Corporation electricity works at Dellingburn, fig. 2, and the necessary alterations made to enable them to work under the new conditions. The exhaust steam from the l.p. cylinders, instead of going to condensers, passes directly to the 25-lb. per sq. in. main. The exhaust from the pumping engines in the refinery is carried to the hotwell and reheated by Weir feed-water heaters, raising the boiler feed water to a temperature of 190 deg. F.

Up-to-date instruments are used in the boiler house, such as indicating steam-flow meters, draught gauges, and CO_2 indicators. The coal used is measured by Lea coal meters, and averages from 40 to 45 tons per day per boiler.

In the engine room pressure gauges are fitted which show the pressures in the different mains, and there is also a B.T.-H. indicating steam-flow meter giving lb. of steam per i.h.p. per hour. An interesting feature in the engine room is the screen fitted between the engines and generators, which is shown in fig. 3, to protect the generators from the effects of steam or oil vapour; a fan is also fitted to draw all vapour from the engines to atmosphere.

Two 750-kW machines coupled together are driven by one engine, fig. 3. One machine supplies d.c. at 500 volts, the other is an a.c. machine generating at 3,300 volts and 50 cycles per second. The second engine set is coupled to two 375-kW, 250-volt machines which act as balancers, and are paralleled on the d.c. bus-bars with the d.c. supply from Greenock Corporation. The a.c. machine can be synchronised with the Corporation h.p. supply. Thus a large proportion of the power required in the refinery is supplied by these Corporation machine mains. At certain arranged times, the refinery supplies electricity (both h.p., a.c. and d.c.) to the Corporation network.

Fig. 4.—Meter Panel and D.C. Switchboard.

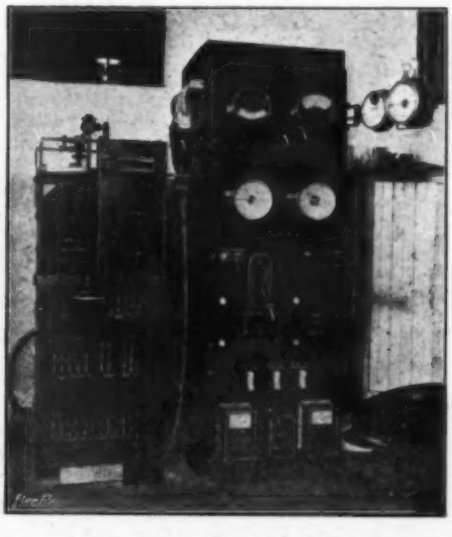

Fig. 5.—High-pressure A.C. Switchboard.

The d.c. switchboard, fig. 4, comprises panels for each machine, Corporation and refinery feeders, and also a special meter panel. The meters are connected between the Corporation feeder panels and the refinery machine panels. The power supplied by the refinery to the Corporation is measured by four 2,000-amp. watt-hour meters (two on the positive and two on the negative

sides), while the supply from the Corporation to the refinery is measured by two 1,000-amp. watt-hour meters. These meters are fitted with non-return gearing, so that when power is being supplied by the Corporation the refinery meters do not register.

The h.p. switchboard controls the 750-kW h.p. generator, and comprises a weak-field relay, synchroscope, and other necessary instruments, fig. 5.

The steam consumption of the engines, 38 lb. per kWh, is considered very satisfactory, as the absence of a condenser is more than compensated for by the advantage of using the exhaust steam as described above.

The refinery obtains the use of the plant for its own purposes, and the Corporation obtains the surplus energy at a cost which it is estimated will share the commercial benefits equally between the parties. The company is under agreement to supply to the Corporation a minimum of two million kWh per annum.

I am indebted to Mr. F. H. Whysall, engineer and manager of the Greenock Corporation electricity department, and to Mr. M. Russell, the engineer at the refinery, for their assistance, courtesy, and permission to publish the above particulars of the scheme.

Legal.

Action Against Newcastle Corporation.

An action was brought against the City Corporation at Newcastle-on-Tyne County Court, on August 13th, by Mrs. Elizabeth Gee, to recover £20 as damages for injuries caused by the alleged negligence of the defendants' servants.—For the plaintiff it was stated that on January 26th she was travelling in a tramcar from Gateshead to Byker, and as the tramcar was going up the Bigg Market, and while it was pushing up a disabled car, both cars commenced to travel backwards. The brakes were applied successfully to the disabled car, but the car in which plaintiff was travelling failed to pull up, and collided with another car in its rear. Most of the passengers managed to get off, but the plaintiff was on the step when the collision occurred, and she was thrown to the ground and injured. The negligence complained of consisted in the tramcar undertaking to push the disabled car.—For the defence it was urged that the plaintiff jumped off the car and fell as it was moving slowly backward. The question was whether or not plaintiff was reasonably under an apprehension of danger.—His Honour gave judgment for the defendants, remarking that the plaintiff jumped off the car, and the emergency was not so great as to justify her doing so.

Alleged Malicious Cutting of Electric Wires.

At the Bournemouth Police Court, on August 7th, the Bournemouth & Poole Electricity Supply Co., Ltd., summoned Joseph Williams on a charge of maliciously cutting certain electric wires, the property of the prosecutors.—Mr. J. M. B. Turner, for the company, said that the defendant had a dispute with a sub-tenant at his premises, and as an act of retaliation cut the wires to the premises at a point before they entered the meter. The wires were left in proximity to one another, in such a position that, had they touched, serious damage would have been caused, or personal injury or death might have resulted if anyone had come into contact with them.—Defendant denied that it was he who had cut the wires on the occasion in question, although he admitted that he had cut wires in the installation on a previous occasion.—The Bench decided to commit the defendant for trial at the next quarter sessions. Defendant was allowed bail in the amount of £100.

The English Electric Co., Ltd., Fined.

At the Bradford City Police Court, on August 14th, the English Electric Co., Ltd., was summoned for a breach of the Factory Regulations in permitting a power press to be operated while not securely guarded. As a result of this neglect an employé had his hand crushed. The magistrate imposed a fine of £1 and costs.

Exports and Imports of Electrical Goods and Machinery in July, 1924.

In common with the general foreign trade totals, the values of the exports and imports in the electrical section advanced during July. The increase in the export figures as compared with June was in the neighbourhood of 20 per cent.; the growth of the import total was proportionately smaller.

As regards exports the increase appears to have been generally distributed, the largest percentage increase occurring in the item "Unenumerated electrical machinery"; other unclassified goods also made a good advance. The uncertain factor "Submarine telegraph and telephone cable" reappears with a value of £18,030. The only decrease of note on the export side was the fall of £12,357 in the value of railway and tramway motors.

The import figures show that the increases and decreases were equal in number, with a slight surplus in the total. The net increase is due chiefly to the rise of £10,977 in the item "Unenumerated electrical goods and apparatus," the other balances practically "cancel out."

In the re-export figures the same item is again prominent as accounting for the bulk of the decrease in the total.

The favourable state of our foreign electrical trade is again reflected in the seven-month totals given at the bottom of our table.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for July, 1924.	Inc. or dec. as compared with June, 1924.	Inc. or dec. as compared with July, 1923.	Electrical imports for July, 1924.	Inc. or dec. as compared with June, 1924.	Inc. or dec. as compared with July, 1923.	Electrical re-exports for July, 1924.	Inc. or dec. as compared with June, 1924.	Inc. or dec. as compared with July, 1923.
Electrical goods and apparatus (unenumerated)	£171,075	+ £38,564	+ £52,431	£79,392	+ £10,977	+ £17,828	£4,910	− £1,013	+ £1,405
Insulated wires and cables ...	207,935	+ 20,292	+ 94,409	33,421	− 999	+ 15,042	—	− 6	− 113
Glow lamps	24,527	+ 555	− 684	12,749	+ 1,206	+ 2,942	76	− 199	− 691
Arc lamps and parts	561	− 277	− 654	1,081	− 498	− 697	75	− 506	+ 75
Batteries and accumulators ...	54,467	+ 4,019	+ 9,148	17,639	+ 1,841	+ 7,518	81	− 362	+ 78
Meters and instruments ...	41,375	+ 10,364	+ 16,591	13,616	− 3,214	+ 7,631	1,822	+ 147	+ 1,474
Carbons	1,866	+ 51	− 7,387	10,870	+ 3,604	+ 5,124	274	+ 200	+ 264
Electrical Machinery—									
Electrical machinery (unenumerated)	237,419	+ 83,690	+ 127,051	89,997	− 5,629	+ 37,675	8,952	+ 710	+ 871
Railway and tramway motors	51,635	− 12,357	+ 21,483	—	—	—	—	—	—
Other motors and generators ...	189,457	+ 40,931	+ 17,843	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	5,672	− 214	− 5,382	12	—	+ 12	2	− 109	+ 2
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	78,125	− £18	+ 24,990	8,673	+ 2,133	+ 6,771	43	− 324	− 2,028
Submarine telegraph and telephone cable	18,030	+ 18,030	− 20,033	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	185,689	+ 38,894	+ 38,803	44,294	− 380	+ 10,419	3,762	− 26	+ 3,239
Totals...	£1,267,863	+ £242,324	+ £368,612	£311,744	+ £9,041	+ £110,265	£19,997	− £1,488	+ £4,576
Increase or decrease for the seven months ended July, 1924 ...		Exports. + £1,533,090			Imports. + £357,703			Re-exports. + £24,635	

Business Notes.

Bankruptcy Proceedings.—RAPHAEL LEDERMAN, electrical engineer, late of 104, Whitechapel Road, E., and elsewhere.—The public examination of this debtor was held last week before Mr. Registrar Hope at the London Bankruptcy Court, the accounts showing gross liabilities of £1,607 (unsecured £453), and assets valued at £13. In reply to Mr. F. T. Garton, Official Receiver, the debtor stated that he came to this country from Russia in 1895, and became naturalised in April, 1924. In March, 1921, witness and his brother-in-law, Myer Heller, each provided £250 capital, and joined in partnership with one B. Barnett, who carried on business under his own name as an electrical engineer at 104, Whitechapel Road, E. A branch business was then opened at 17, Maddox Street, Regent Street, W., under the style of "The Regent Electrical Installation Company." Both businesses were continued until July, 1921, when in consequence of disagreements, the partnership was dissolved, and at the instance of witness and Heller, a receiver was appointed, who carried on the business for a short time. All the liabilities of that business had been discharged. In or about June, 1921, witness and Heller also commenced business as electrical engineers at 201, Commercial Road, E., under the style of "Lederman and Heller," but in June, 1923, that business was closed and the partnership dissolved. In January, 1920, he and Heller purchased for £2,000 "The Grand Cinema Theatre," Turnpike Lane, Hornsey; they carried it on for about a year, and then sold it for the same figure. The debtor attributed his insolvency to heavy law costs. The examination was concluded.

CHARLES GUSTAVUS HOFFMAN, wireless component part manufacturer and electrical engineer, trading as J. W. Chambers & Co., Andrews Works, Cowthorpe Road, Wandsworth Road, and 7a, Victoria House, South Lambeth Road, S.W.—The first meeting of creditors under this failure was held last week at the London Bankruptcy Court. Mr. F. T. Garton, Official Receiver, reported that it appeared from the debtor's statements to the Examiner, that he was in employment as an engineer, prior to the war, and during hostilities he was employed at Woolwich Arsenal. Towards the end of 1921, he opened a retail radio apparatus shop at South Lambeth Road. That business prospered, and he took up manufacturing, with the result that the business continued to grow, and he employed several men. Subsequently he was introduced to a Mr. Lilley, junr., who advanced him money with a view to partnership, and forming the business into a company. Owing to illness, he was unable to give personal attention to the business which during that period was practically controlled by Mr. Lilley. On July 4th last he returned to business and was ordered off the premises by Mr. Lilley and his men, but acting on the advice of his solicitor, he returned to the premises, and turned them out. He then locked up the place and had since done very little business. A meeting of his creditors was held in July last, when it was discovered that a certain amount of stock was missing, it having disappeared whilst he was ill. Eventually he was advised to file his petition in order that the matter might be cleared up, and the missing stock traced if possible, and also to protect the remaining assets. He estimated his liabilities at £3,000 and his assets at between £400 and £500. It was decided to appoint Mr. E. H. Hawkins, of 4, Charterhouse Square, E.C.1, as trustee of the estate, to act in conjunction with a committee of inspection which was also appointed. The trustee's security was fixed at £400.

SALVATORE SCARFI, trading as Scarfi Brothers, cycle, gramophone and wireless agent, 78, Alexandra Road, Newport, Monmouthshire.—The public examination of this debtor was held on August 12th, at the Town Hall, Newport, Mon. The statement of affairs showed liabilities of £1,968 8s. 9d. and assets of £344 17s. 6d. Debtor attributed his failure to bad trade and depreciation in stock. It was stated that though the debtor had only been trading since May of last year, his deficiency was over £1,600 and there were complaints from a large number of his creditors. The accounts were incomplete and debtor was ordered to prepare a proper cash and trading account from May 23rd of last year to the date of the receiving order. The examination was adjourned.

LOUIS ADOLPHUS PRIDAY, 20 & 22, Somers Road, Southsea, Hants, plumber and electricinn.—The public examination of this debtor was held on August 11th, at the Court House, Portsmouth. According to the statement of affairs there was a deficiency of £157. Debtor attributed his failure to bad trade owing to competition, employing men when he had insufficient work on hand, law costs on summonses, and loss on goods sold under execution. Debtor stated that he commenced business with a partner in March, 1906, with a capital of £20 each, but the partnership was dissolved two years later and debtor continued trading alone on payment of £70 to his partner, £50 of which he borrowed from his brother. Of that £50 he had repaid £20. He was able to make a living up to two years ago, but since then he had gradually got into debt. The examination was closed.

A. W. MATTHEWS AND F. G. MATTHEWS, trading as The Electrical, Gas & Engineering Co., 130, Main Road, Handsworth, Sheffield, Yorkshire, electrical, gas, and engineering contractors.—The first meeting of creditors was held on August 13th, at the Official Receiver's office, Figtree Lane, Sheffield. The statement of affairs showed liabilities, expected to rank, of £177, and assets of £3. The case being a summary one was left in the hands of the Official Receiver as trustee of the estate.

J. S. MCLEOD (McLeod Bros.), radio and electrical engineer, 189, Blackburn Road, Bolton, and also with a partner as McCloud Bros., at 55, Chorley New Road, Horwich.—First meeting, August 26th, at the Official Receiver's offices, Byrom Street, Manchester. Public examination, October 14th, at the Court House, Bolton.

W. E. MELROSE, electrical engineer, Chewton Road, Keynsham.—First meeting, August 27th, at the Official Receiver's offices, 26, Baldwin Street, Bristol. Public examination, October 3rd, at the Guildhall, Bristol.

A. C. R. BIRKETT, electrical engineer, 22 and 24, Wheelergate, Nottingham.—First meeting, August 26th, at the Official Receiver's offices, 4, Castle Place, Nottingham. Public examination, October 2nd, at the County Court House, Nottingham.

F. J. PEARSE, maker of electric light fittings, Brixton Hill, and lately of Beauchamp Place, Brompton Road.—It is expected that creditors will be paid in full at an early date.

T. STEEL (Sprowston Motor Works), automobile and electrical engineer, Sprowston Villa, Sprowston Road, Forest Gate.—Receiving order made August 7th on creditor's petition. First meeting, August 22nd. Public examination, October 28th, both at Carey Street, W.C.

C. W. A. ASHWORTH, electrical engineer, West Street, Oundle.—Receiving order made August 9th on debtor's own petition.

A. JONES, electrical engineer, 2, Robert Street, Ynysbwl, Glamorgan.—First meeting, August 22nd. Public examination, September 25th, both at the Court House, Pontypridd.

G. A. MORLEY (A. Whale & Co.), electrical and wireless engineer, 201, Powis Street, Woolwich.—Last day for proofs for dividend, August 27th. Trustee, Mr. T. Gourlay, 29, Russell Square, W.C.

D. C. FIELDING, wireless dealer, 48a, Cloth Market, Newcastle-on-Tyne.—Trustee, Mr. J. C. Blakey, 28, Pilgrim Street, Newcastle-on-Tyne, appointed August 13th.

I. FAULKNER (Provincial Lighting and Engineering Co.), electrical engineer, 369, Eccles New Road, Weaste, Salford.—Last day for proofs for dividend, August 30th. Trustee, Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

L. KELSALL AND H. KELSALL (Kelsall Bros., electrical engineers, Dover).—Messrs. Radio Instruments, Ltd., state that it is creditor in this bankruptcy for only £9 12s. 9d., not £276, as stated in the ELECTRICAL REVIEW, August 1st, p. 177. Our information was based upon the debtor's statement.

J. A. BOSHER, electrical engineer and contractor, 7, Brondeg Terrace, and 33, High Street, Aberdare.—Receiving order made August 11th, on debtor's own petition.

Company Liquidations.—J.W.B. ACCUMULATORS, LTD. (formerly J. W. Barnard & Haynes, Ltd.), 4, Great Winchester Street, London, E.C.—Pursuant to Section 188 of the Companies (Consolidation) Act, 1908, a meeting of creditors was held on August 11th, at the Chartered Institute of Secretaries, London Wall, E.C. Mr. F. H. Conning, who presided, stated that he had been appointed to act as the liquidator in the voluntary liquidation. A statement of affairs was presented which disclosed liabilities of £1,361, all due to unsecured creditors. There were also debenture bonds amounting to £478. The total assets were £1,223, from which had to be deducted £18 for preferential claims, and £478 for debentures, and trade debts owing by the Receiver £104, leaving net assets of £623, or a deficiency of £737. The business was carried on prior to 1923 by Mr. Barnard. He sold it to a limited company styled J. W. Barnard & Haynes, Ltd., and they changed the name of the company towards the end of April last to J.W.B. Accumulators, Ltd. The meeting broke up without any resolution being passed. The voluntary liquidation will therefore be continued with the present liquidator.

THE RADIECO, LTD., Stileman's Works, Wickford.—The creditors interested herein were called together recently at Norwich Union Chambers, High Street, Chelmsford. Mr. C. D. Duff, C.A., reported that the company had gone into voluntary liquidation, and had appointed him to act as liquidator. He had prepared a statement of affairs which disclosed liabilities of £2,250. The net assets were £1,975, or a deficiency of £275. There was a debt in the books of £946, which it was not expected would be realised. The company was registered on January 30th, 1924, with a nominal capital of £2,500, divided into shares of the face value of £1 each, to acquire as a going concern the business which had been carried on by Mr. F. A. Mayer at Wickford. The consideration payable to the vendor for the assets transferred was £2,398, which was satisfied by the allotment of fully-paid shares. The directors were Mr. F. A. Mayer, Mrs. B. E. Mayer, and Mr. A. E. T. Catchpole, the latter taking up 100 shares for cash. Apparently that £100 was the only actual cash subscribed. The principal asset was the stock consisting of wireless sets assembled by the company, and a quantity of accessories. It was pointed out that if the stock was realised at the moment it would not produce such

good prices as could be obtained at a later period of the year. The premises were held upon a weekly tenancy. No trading or profit and loss accounts had been prepared, but it was estimated that between January and July of the present year the purchases totalled £6,755, against sales of £7,770. There had been returns of £459, reducing the sales to £7,311. The overhead charges had been in the neighbourhood of £50 a week. The position disclosed was discussed at considerable length, and eventually it was decided that an application should be made to the Court for the appointment of Mr. W. J. Osborne, of Messrs. Corfield & Cripwell, Balfour House, Finsbury Pavement, E.C., as joint liquidator with Mr. Duff, together with a committee of inspection consisting of the representatives of the General Electric Co., Ltd., Mr. C. A. Patterson, Romford, and Mr. E. Judd, of Corfield's Traders' Association. The principal creditors are:—

	£		£
General Electric Co., Ltd. ...	468	S. G. Brown & Co.	65
Siemens Bros. & Co., Ltd. ...	224	Mullard Radio Valve Co., Ltd.	97
E. H. Ross	55	Hatner & Ackstein	70
Nettlefold & Sons, Ltd, ...	78	M. Baer	50
Sterling Telephone Co., Ltd. ...	86	Edison Swan Electric Co., Ltd.	83
Dubilier Condenser Co. ...	60		

WIRELESS EQUIPMENT, LTD., radio engineers and manufacturers, 90, Charing Cross Road, W.C.2, and 64, Berwick Street, W.—A meeting of the creditors of this company was held recently at Salisbury House, London Wall, E.C. Mr. H. H. Foster, C.A., the receiver for the debenture holder and the liquidator in the voluntary liquidation of the company, submitted a statement of affairs, which showed liabilities of £2,721, of which £1,124 was due to the trade and £1,600 to debenture holders. The assets consisted of furniture and fittings £157, estimated to realise £35; plant £294, expected to produce £50; stock at cost £745, valued at £500; share in the British Broadcasting Co., £1; book debts £941, expected to produce £765; and cash at bank and in hand £11. The assets therefore totalled £1,362, or a deficiency of £1,359. Mr. Foster reported that the company was formed in May, 1922, with a nominal capital of £5,000, of which £3,450 had been issued and was fully paid. Originally the company traded under the style of Wiring, Ltd., but subsequently the name was changed. In common with many other concerns in the radio trade, the company had experienced severe disappointment, and his view was that the company was insolvent at the end of last year, but money was then raised on the security of debentures. The directors had foregone their salaries and fees owing to lack of funds, but it was believed that the company had a good contract pending and it was decided to continue. Cash to the extent of £800 was obtained on debentures in January, and a further £300 had previously been advanced. By an oversight, the debentures for £1,100 were not registered. A further £500 was raised on the security of debentures last May. The company had a contract to supply a thousand crystal sets a year but owing to the non-delivery of certain materials, they were unable to complete the order. Mr. P. Houstoun, of the British Traders' Association, inquired when the debentures were first created, and the liquidator replied that they were not legally created until they were registered in May of the present year. Apparently the debentures were issued on May 2nd, 1924, and the principal holder was Mr. L. N. Stephens, who was a director of the company. Mr. Houston said he did not think the debentures were valid as against the claims of the unsecured creditors, and the liquidator replied that the matter appeared to be one for inquiry. Mr. Houstoun remarked that the new debentures were issued for a past consideration, and as the transaction was within three months of the company's going into liquidation, they could not hold good against the creditors. Mr. Stephens stated that he held debentures for £800, and was willing to withdraw them and rank as an unsecured creditor for the amount. He thought the other debenture holders would agree to the same course. After a short discussion, a resolution was unanimously passed confirming the voluntary liquidation of the company, subject to the debenture holders ranking as unsecured creditors. Mr. W. A. J. Osborne, of Messrs. Corfield and Cripwell, Balfour House, Finsbury Pavement, E.C., was appointed to act as joint liquidator with Mr. Foster, while a committee of three of the creditors was also appointed. The following are among the creditors:—

	£		£
Mullard Radio Valve Co. ...	35	Chas. G. Clark	36
L. McMichael & Co.	33	Strong & Perry	45
A. E. Stokes	29	E. R. Brown	115
W. S. Marson	36	Engineering Supplies, Ltd. ...	53
M. E. L., Ltd.	66	Fuller's United Electric Works,	
A. G. Narsh	36	Ltd.	32
Halloday & Co.	31	Wainwright Mfg. Co.	43
British Thomson-Houston Co.,		General Wireless, Ltd.	45
Ltd.	34		

CATCHPOLE & MAURICE, LTD., electrical engineers, &c., 59 and 61, New Oxford Street, W.C.—Under the compulsory liquidation of this company accounts have been lodged showing liabilities £3,104, against assets valued at £1,466 and a deficiency of £6,158 as regards contributories, the issued capital being 4,500 ordinary shares of £1 each. Mr. J. Barwick Thompson, Official Receiver, reports that the company was registered in May, 1920, as a private company, with a nominal capital of £5,000, divided into 1,000 preference and 4,000 ordinary shares of £1 each, to acquire and carry on the wholesale and export electrical and mechanical engineering business of Arthur Edward Catchpole and Cyril Bertram Maurice. By a special resolution in October, 1921, the unissued preference shares were converted into ordinary shares. The purchase price of the goodwill (£797) and assets of the business as on February 28th, 1920, was fixed at £2,000 and was satisfied by the allotment of fully paid-up shares. Maurice states that the company's trading for the first year was profitable, but that afterwards the effect of the trade slump in 1920-21 was felt and losses were incurred. A bank overdraft was obtained on securities deposited by Messrs. Catchpole and Scovell (a director), but it was paid off before the liquidation. Maurice further states that goods were ordered from the petitioning creditor (who is a German national) on account of their cheapness. In the latter stages the members of the board did not appear to have worked harmoniously together, and the business suffered in consequence.

STAR ELECTRICAL ENGINEERING & MANUFACTURING CO., LTD.—A meeting of members is called for September 15th, at 67, Cleethorpes Road, Grimsby, to hear an account of the winding up from the liquidator, Mr. W. R. Boyd.

E.B.C. ELECTRICAL CO., LTD.—A meeting of members is called for October 2nd at 3, Thames House, Queen Street, E.C., to hear an account of the winding up from the liquidator, Mr. F. Rowland.

CORONA LAMP WORKS, LTD.—Liquidator, Mr. H. E. Burgess, Senior Official Receiver, Carey Street, W.C., released August 7th.

Dissolutions of Partnership.—MANDEFIELD & WHITE, electrical engineers, 28, Clarence Street, York.—Mr. H. Mandefield and Mr. A. E. White have dissolved partnership. Debts will be attended to by Messrs. A. I. C. Forster and Stott, 2, Stonegate, York.

J. W. BUCK SWITCH CO., 39, Victoria Street, London, S.W.1, manufacturing electricians.—Mr. J. W. Buck has retired from this partnership. Mr. W. P. Brooks has taken over the business as sole proprietor, and will attend to debts, &c.

Trade Announcements.—REDHILL ELECTRICAL AND RADIO Co. has been registered as a limited partnership for buying, manufacturing, and selling radio apparatus and components at 35a, Clarendon Road, Redhill. Mr. J. Brems, of Reigate, electrician, is registered as a general partner, and Mr. J. Matthews, of Redhill, as a limited partner.

THE ELECTRIC REPAIR & LIGHTING CO., of Reading, has removed its business from 6 & 10, Merchant's Place, Reading, to larger premises at 106, Friar Street.

MR. W. N. BISHOP, electrical engineer, of 23, York Road, Maidenhead, has taken larger premises at 144, High Street, in that town.

After August 11th the West of England will have its own central Exide Service depôt at 22, Victoria Street, Bristol. This depôt, the CHLORIDE ELECTRICAL STORAGE CO., LTD., announces, will carry large stocks of all types of batteries for car starting, lighting, ignition, and high- and low-pressure wireless batteries. The depôt will be under the care of Mr. A. C. Stewart, who for about 18 months has been representing Exide batteries in the West of England.

Mr. R. REDMAN, electrical contractor, of Gravesend, has removed his business from 189, Parrock Street, to 4, Manor Road.

Messrs. J. SELLAR & CO., LTD., of London Road, Southend-on-Sea, announce that they have given up their electrical business.

MR. H. BAILEY is shortly severing his connection with the Wandsworth Electrical Manufacturing Co., Ltd., whom he has represented for the past eighteen years, including eleven years spent in London.

Mr. W. E. HURST has been elected a director of the Hurst Electrical Plant, Ltd., of Belfast.

Catalogues and Lists.—MESSRS. CHARLES JOYNER & Co., Icknield Square, Birmingham.—A folder containing verse and illustrations relating to the "Angelus" electric fire.

THE SUN ELECTRICAL CO., LTD.—A fully priced and illustrated catalogue (No. 412) of domestic electrical appliances of all kinds—fires, irons, kettles, toasters, cookers, &c. Also a booklet on "High Efficiency Lighting," containing prices and details of fittings for commercial and industrial use.

MESSRS. CROMPTON & CO., LTD., Chelmsford.—Leaflet No. 242, illustrating and describing high- and low-pressure a.c. draw-out cubicles, and a booklet dealing with the company's stand and other work at the British Empire Exhibition.

MESSRS. L. MCMICHAEL, LTD., Hastings House, Norfolk Street, Strand, W.C.2.—A new showcard advertising the firm's h.f. plug-in transformer, l.f. transformer, and fixed condenser and clips.

MESSRS. DAVID CARLAW & SONS, LTD., 31, Finnieston Street, Glasgow.—A pamphlet containing a view of the company's works, and illustrations of a swing-tray elevator and a band conveyor.

THE EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—A very comprehensive catalogue of the whole of the company's electrical supplies. The volume is divided into thirteen sections—lamps, instruments, meters, and switchgear, wires and cables, motors, radio apparatus, &c.—and contains about 400 pages, which are fully illustrated and priced.

We have also received from the company a leaflet dealing with its l.f. intervalve transformer, and pamphlets illustrating and describing the "Ediswan" rotary potentiometer and double head-phones.

THE NATIONAL GAS ENGINE CO., LTD., Ashton-under-Lyne.—A well-illustrated catalogue of "National" self-starting heavy oil engines.

MR. GEORGE ELLISON, Perry Barr, Birmingham.—A booklet dealing with electric circuit breakers generally and the Ellison "Mill" type breaker particularly.

MESSRS. S. G. LEACH & CO., LTD., 26-30, Artillery Lane, E.C.—List L.G.1 containing a list of electrical goods supplied by the firm, together with a circular letter dealing with the company's business.

THE HEWITTIC ELECTRIC CO., LTD., 80, York Road, King's Cross, N.1.—A well-illustrated pamphlet describing the use of "Hewittic" mercury-vapour rectifiers in semi-automatic and automatic sub-stations.

THE LONDON ELECTRIC WIRE CO. & SMITHS, LTD., Playhouse Yard, Golden Lane, E.C.1.—Two price lists of high-resistance wires and insulated wires for radio purposes respectively.

Private Arrangements.—G. H. WATKINS, electrical engineers, 7 and 9, Terminus Buildings, Southfields Road, Eastbourne, and 195, London Road, East Grinstead.

A meeting of the principal creditors was held recently at the offices of Messrs. Poppleton, Appleby & Hawkins, accountants and auditors, 4, Charterhouse Square, E.C. Mr. E. Judd, of Corfield's Traders' Association, who represented the principal trade creditors, was elected to the chair.

A statement of affairs was presented, which showed ranking liabilities of £1,379, of which £1,274 was due to the trade and £105 to a cash creditor. The bank was a fully secured creditor for £549. The assets totalled £1,603, and were estimated to realise £948, on the basis of a going concern. After allowing £32 for preferential claims, the net assets were £400; tools, fixtures, &c., £150, estimated to realise £70; motor car £95, valued at £25; book debts £545, expected to produce £425; and work in progress valued at £28.

Mr. W. Baker reported that the debtor, finding himself in some difficulty, consulted his largest trade creditors, and as a result, it was decided to protect the estate by executing a deed of assignment to Mr. E. H. Hawkins. The debtor commenced business at Eastbourne in 1910, when he took a portion of the premises at 9, Terminus Buildings. He then had a capital of £100, which he borrowed from his father and subsequently repaid. He had, however, since had other advances from his father, who was now a cash creditor to the extent of £105. The debtor carried on business successfully up to two or three years ago. With a view to increasing the turnover, the debtor some six years ago obtained a lease of the shop at 7, Terminus Buildings. The lease had several years to run, but it had been deposited with the bank. A year ago the debtor decided to open premises in East Grinstead, and obtained the shop there on a ten years' lease. Proper books of account had been kept, and it appeared that during the 12 months ended March 31st last, the turnover was £3,639, with a gross profit of £421, but there was a net loss on the trading of £311. The drawings of the debtor had been nearly £8 a week. The debtor attributed his present position to a falling off in trade and keen competition, but his overhead expenses appeared to have been greater than the business could stand. In order to reduce the expenses, the debtor was negotiating for the sale of the lease of the shop at 7, Terminus Buildings, for which an offer of £400 had been received. If the shop was given up there would be a considerable saving as the shop trade was not very good, and it was not thought that the turnover would be appreciably affected. The debtor desired to continue the business, and offered a composition of 13s. 4d. in the £, payable by four quarterly instalments. That offer represented all the creditors were likely to get, if the assets produced on a forced sale, the figures at which they appeared in the statement, but the probability was, however, that if the offer was not accepted and the estate was realised, that the creditors would not receive anything like the amount of the offer.

After a short discussion, a resolution was passed confirming the deed already executed to Mr. Hawkins, while it was also decided to accept the debtor's offer, his father withdrawing his claim. A committee was also appointed consisting of Mr. E. Judd and the representatives of Edison Swan Electric Co., Ltd., and Falk, Stadelmann & Co., Ltd.

The principal creditors are:—

	£		£
Drake & Gorham, Ltd.	612	Falk, Stadelmann & Co., Ltd.	124
British Thomson-Houston Co., Ltd.	30	W. N. Froy & Sons	45
Chloride Electrical Storage Co., Ltd.	27	W. T. Henley's Telegraph Works Co., Ltd.	42
Edison Swan Electric Co., Ltd.	80	Page & Miles	30

HAROLD WILLIAM MCCUBBIN and JOHN LANE, trading as the Bridge Electrical Co., electrical factors, 78, King Street, Manchester.—A meeting of the creditors of the above was held recently, at 7, Brazennose Street, Manchester. A statement of affairs had previously been circulated to the creditors by Mr. G. H. Blair, Manchester, which disclosed liabilities of £1,537, all of which were due to the trade. The assets were estimated to produce £956, from which had to be deducted £15 for preferential claims, leaving net assets of £941, or a deficiency of £596. The assets consisted of stock £130, estimated to realise £50; book debts £1,101, expected to produce £881; cash at bank £7; fixtures, fittings, &c., £46, valued at £15, and deposits £3. The deficiency account showed that on January 1st last the capital of the partners was in credit to the extent of £138. The accountant reported that as the result of inquiries, he thought the liabilities would be reduced to £1,241. The debtors commenced business on January 1st, 1922, with a joint capital of £50. The present position had been brought about chiefly by bad debts. The debtor Lane had for some time past been ill. The deed of inspectorship had already been executed by Mr. Blair with a view to the business being continued and the accounts paid in full over a period of 18 months, together with interest at the rate of 5 per cent. per annum. The turnover for the year to December 31st last was £5,672 with a gross profit of £677, and a net profit of £396. Between January 1st and July 29th of the present year, the turnover was £2,903, with a gross profit of £437, and after allowing for all the expenses, there was a net loss of a trifling amount. The creditors passed a resolution agreeing that the debtors should be given time within which to find security for the payment of a composition which would be satisfactory to a committee. The committee consisted of Messrs. A. Cripwell, Birmingham; C. Turner, Sheffield; and the representatives of the Vulcan Electrical and Mechanical Co., Ltd., London; Electrical Supplies, Ltd., Manchester; and Magic Appliances, Ltd., Manchester.

Book Notices.—"National Physical Laboratory, Collected Researches," Vol. XVII. 1922. London: H.M. Stationery Office. Price 17s. 6d. net.—This volume contains a collection of 31 papers reprinted from the transactions of societies, and dealing with investigations carried out in the Optics Division of the N.P.L.

"*Journal* of the Institution of Electrical Engineers," Vol. LXII, No. 332. August, 1924. London: E. & F. N. Spon, Ltd. Price 10s. 6d.—The August number contains the following papers:—"Transmission Maintenance of Telephone Systems," by Messrs. P. E. Erikson and R. A. Mack; "Thermionic Valves with Dull-emitting Filaments," by the research staff of the General Electric Co., Ltd.; "Some Radio Direction-finding Observations on Ship and Shore Transmitting Stations," by M. R. L. Smith-Rose; "Some Factors Affecting the Working Costs of Small Electric Generating Sets," by Mr. E. G. Kennard; "The Atkinson-type Repulsion Machine as a Motor and Generator," by Mr. F. J. Teago.

"Le Téléphone à Stockholm," by Anders Lignell. Pp. 91, illus. Stockholm: A.-B. Fahlcrantz Boktryckeri.—This historical description, in French, of the telephone system in Stockholm, covering a period of 44 years, was specially produced in connection with the 8th Universal Postal Congress by the director of the Stockholm telephones. The telephone has played an important part in the life of the city, where to-day there are something like 270 stations per 1,000 inhabitants, which is a remarkable figure not surpassed, we believe, by any American city. The illustrations include portraits of pioneers of the art and industry, including Cedergren and Ericsson, but the bulk of the pictures are reproductions from Swedish comic papers which, in the accepted manner, animadvert upon the shortcoming of the telephone, its operators and users.

"Memoirs of the College of Science, Kyoto Imperial University." Series A, Vol. III, No. 3, March, 1924. (61 pp.) Kyoto: Maruzen Co., Ltd. Price 1 yen.—This issue contains a number of papers in English and German on chemical subjects.

For Sale.—The London County Council Stores Department has for disposal electric car controllers, motors, circuit breakers, switches, &c. (See our advertisement pages to-day.)

Lead.—Reporting on August 16th, Messrs. James Forster and Co. state:—"The general position is unchanged. Consumers have enough lead in hand for a month, or even longer; supplies are pouring in from all sources, 11,500 tons having arrived already this month in London and Liverpool. It is somewhat astonishing that the large arrivals in July and this month have not had any effect on prices, but the market is so much under the influence of 'Bull' speculation on a favourable settlement of the reparations question that the real position of supply and demand is ignored. The Board of Trade returns for July, 1924, are:—Imports, 24,536 tons; exports, 4,619 tons; left for home absorption 19,917 tons."

Reparations Duty.—The Government has decided to reimpose, as from September 2nd, the 26 per cent. duty upon German goods entering this country, under the Reparations Recovery Act, which was reduced a few months ago to 5 per cent. All moneys collected in this way are to be deducted from the amounts due from Germany under the "Dawes" plan.

Halifax Municipal Trading.—At a recent meeting of the Halifax Chamber of Trade, Mr. A. Lewin, secretary of the Halifax and District Electrical Employers' Association, made a strong protest against the business carried on at the Corporation's electrical showroom. He said that there was no objection to the hiring-out of appliances by the Corporation, but it was going much farther than this and even sold lamps and radio apparatus. A sub-committee of the Electricity Committee had been interviewed on the subject, but the only concession made was a discount of 15 per cent. to contractors who induced consumers to purchase apparatus at the showroom. What was required was a working arrangement such as was in force at Leeds. Other speakers pointed out that the turnover could not be sufficient to make the showroom remunerative, and it was resolved that the Electricity Committee should be asked to adopt an agreement with the electrical traders of the town similar to that formulated at Leeds.

Conditions in Lithuania.—In a report upon the economic and industrial conditions in Lithuania which he has presented to the Department of Overseas Trade (Stationery Office, 1s. net), Mr. H. H. Cassells, British Consul at Kovno, emphasises the fact that Lithuania is essentially an agricultural country; as such its interest to our readers is of small dimensions. There appears to be a good market for a number of non-electrical lines, but in electrical goods, lamps, fittings, &c., "Germany has the chief share. British prices are said to be non-competitive." The greater portion of the machinery and tools required is also provided by Germany. In connection with radio-telegraphy, it is stated that a French company has received a contract to erect a high-power station at Kovno. It is hoped to have the work completed by the autumn of this year. A list of imports during 1923 includes an item "Electrical Supplies" amounting to 220 metric tons, valued at 1,202,000 lits (the pound sterling is equivalent to 43-47 lits according to the current rate of exchange).

Australian "Dumping" Duties.—Last week's *Board of Trade Journal* contained a notification of the application by the Commonwealth Government of "dumping" duties to British induction motors, and German electric kettles.

Radio Apparatus for Denmark.—A confidential report on the market for wireless apparatus in Denmark has been prepared by the Department of Overseas Trade from information received from the Commercial Secretary at Copenhagen (Mr. Richard Turner, O.B.E.).

Chinese Notes.—The official *Chinese Economic Bulletin* states that the Sungkiang Telephone Co. (Kiangsu province) has issued $20,000 of new capital for the provision of long-distance services.

The property of the Water & Electric Works Co. in Chapei, Shanghai, has been transferred to a private corporation with a capital of $4,000,000. Electricity will be supplied in the district by the corporation upon the expiration of a contract with the Shanghai Municipal power station.

The director of the radio administration of the Kwangtung province has asked the authorities for a grant for the purpose of repairing the damage to the equipment and buildings of Tsinshan station, near Macao, caused by a typhoon.

Deed of Assignment.—J. MORTON & SON, electrical and general engineers, Dalduff and Strath, Newmilns, and R. B. MORTON, engineer, Dalduff House, Newmilns, sole partner of the said firm. Particulars of claims to the trustee, Mr. A. P. Neilson, 7, Bank Place, Kilmarnock.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from the dates mentioned. In the case of foreign applications, the name and address of the British representatives are also given.

Conduro. No. 449,730. All goods in Class 5.—British Insulated & Helsby Cables, Ltd., Prescot, Lancs. August 13th, 1924.

Magnet. No. 444,263. Class 8. Fitted switchboards and electrical protective gear. No. 440,350. Class 13. Electric switches, fuses, and plugs, none of the goods in either class containing a magnet.—Frank Brimson Cox, trading as the Magnet Engineering Co., 65, Fleet Street, Liverpool. August 13th, 1924.

Olympic. No. 447,434. Class 8. Wireless telephonic and telegraphic apparatus.—The Wholesale Fittings Co., Ltd., Commercial Lamp Works, 23-27, Commercial Street, London, E.1. August 13th, 1924.

The Western Union Wireless Co., The Permion detector (lettering and design). No. 449,657. Class 8. Detectors for wireless receiving sets.—Ernest Percy Higgins, trading as the Western Union Wireless Co., 99, Regent Street, London, W.1. August 13th, 1924.

Cellulak (lettering and design). No. 4,459, 445,843. Class 50. Electrical insulation materials, namely, laminations of fibrous material bound together by natural or synthetic resin and made up in the form of sheets, blocks, rods, tubes, and cylinders.—Irvington Varnish and Insulator Co., Irvington, N.J., U.S.A. (F. W. Golby, 3, John Street, Bedford Row, London, W.C.1.). August 13th, 1924.

Electrite. No. 449,567. Clas 50. Manufactured or electrically-produced abrasive grit for making grinding implements or grinding surfaces.—The Anglo-American Abrasive Co., Ltd., 6, Idol Lane, London, E.C.3. August 13th, 1924.

Tramway Employés' Wages.—Sunderland Corporation Tramways Committee, which is acting independently on the question of wages, has adjourned for three months an application by the employés for 2s. a week advance.

Japanese Trade-mark Imitations.—The Federation of British Industries has been asked by the Department of Overseas Trade to furnish particulars of any instances in which its members' trade-marks, trade names, &c., have been counterfeited or imitated by Japanese subjects during the last few years. The inquiry extends also to the imitation of the outward appearance or packing of articles, &c.

An Electrical Brown Coal Excavator.—Messrs. Ruston and Hornsby, Ltd., have completed a large electrically-driven crane-excavator for use in the brown coal fields of the Latrobe River Valley, Victoria. It is stated that only two men will be needed for its operation, although it is capable of loading 3,000 tons of coal in eight hours.

Unemployment.—The increase in the number of persons registered as totally unemployed continued during the week ended August 4th, when the total was 1,080,500, or over 32,000 more than at July 28th. The net decrease since the beginning of the year, however, has been 205,000.

Railway Shopmen's Wages.—A meeting of the trade unions concerned in the recently-refused demand for increases in the wages of men employed in railway workshops is to be held to-day (Friday). It was stated that the National Union of Railwaymen would be invited to be represented. The railway companies state that they are willing to submit the claims to the Industrial Court, if at the same time their demand for the reduction of the war bonus from 16s. 6d. to 10s. is also submitted to the Court.

At a meeting on August 14th last between representatives of the railway companies and the unions concerned several concessions were made with regard to improved conditions, but the companies refused to discuss the matter of increased wages.

Sydney Electrical Contracts.—In a report submitted to the Committee of Aldermen charged with the investigation of allegations of collusion between firms submitting electrical tenders to the Council, Mr. F. S. Boyce, K.C., the Corporation's counsel, states that upon the evidence given at the inquiry he is unable to recommend the appointment of a Royal Commission to deal with the matter. The question was opened by Mr. J. B. Suttor, M.L.C., formerly manager of the Australian General Electric Co., who alleged that certain electrical contractors made a practice of adding extra sums to their tenders for distribution to unsuccessful tenderers. Beyond making certain statements, Mr. Suttor refused to give specific instances of the practice, saying that he preferred to reserve such evidence for a higher tribunal. Mr. Bryce thought that although a Royal Commission would clear up any imputations against the aldermen and officers of the Council, the case was so nebulous that definite results were unlikely to be attained.

The Marking of Goods for Shipment.—In a recent article the *Electrical World* gave some useful hints to exporters upon the marking of bales and cases. It was pointed out that the use of too-small stencils for lettering should be avoided; letters should not be less than 2 in. high, and in the marking of large cases 5-in. letters are not too big. Brush marking, apart from the fact that some countries prohibit it, is most unsatisfactory for foreign shipment; stencilling should always be employed. Another point to be remembered is that it is useless to place caution marks such as "fragile, with care" in English only upon cases which are being dealt with in foreign ports; the language of the country of destination should also be used.

Swedish Electrical Dispute.—A labour dispute has occurred in the electrical equipment branch. Fitters at several places during the last few months have been making joint requests for an increase of wages, which have been rejected by the employers. At Stockholm 400 fitters decided to strike on August 13th as their claims were not granted. The strike is stated to be a violation of the agreement now in force.—*Reuter's Trade Service* (Stockholm).

Electricity the Smoke Eliminator.—The Yorkshire Electric Power Co. has published a leaflet extolling the virtues of electricity as a means of reducing or eliminating the smoke nuisance.

The German Industrial Position.—Germany's industrial world is passing through a crisis which obviously has not yet reached its climax. This is especially the case as regards the engineering trade. The Association of German Engineering Works states that the difficulties of the engineering industry intensified during July. A great number of works had to cut down their working time by four hours per week compared with June, while the number of workmen, compared with July of last year, showed a decrease of 20 per cent. The number of orders, both from home and abroad, is decreasing continuously; to this must be added the money stringency, which, together with the impossibility of granting long credits to customers, prevents the works from doing any important business.—*Reuter's Trade Service* (Berlin).

A "C. T. S." Offer.—The advertisement of the St. Helens Cable & Rubber Co., Ltd., in this issue offers rewards amounting to 20 guineas for particulars of the installation of c.t.s. cable in plaster.

Indian Import Exemptions.—The Governor-General-in-Council of India has recently issued an order exempting from import duty any telephones and appurtenances or instruments for telegraphic or visual signalling and their appurtenances "imported into India direct by or for the use of (a) any unit of His Majesty's regular forces serving in India or of the Auxiliary Force, India, or (b) any unit of Indian State Forces."

British Empire Exhibition Notes.—The WESTERN ELECTRIC CO., LTD., has issued a souvenir booklet dealing with its activities in the world of telephony. A coloured frontispiece by Laurie Taylor depicts the opening of the Exhibition by the King, involving the use of the Western Electric "Public Address" system.

In response to representations made by Mr. C. H. Fletcher, of Fuller's United Electric Works, Ltd., on behalf of exhibitors, the Exhibition authorities have arranged for the collection of letters up to 10.10 p.m. instead of up to 8 p.m. as hitherto.

The total number of visitors to the Exhibition since it opened on April 23rd reached 10,000,000 early on August 12th, the 95th day of the show.

Some friction has arisen between some of the exhibitors in the Palaces of Engineering and Industry at Wembley and the Exhibition authorities. It has been the practice of some exhibitors to close their stands at 6 p.m., and this has led to a great deal of dissatisfaction on the part of visitors. The Exhibition authorities have a definite contract with the exhibitors to keep their stands open until 10 p.m., and in future all exhibits will be kept open until that hour.

In connection with the Bloomfield-Gibbons fight at the Wembley Stadium, on August 9th, a complete Marconiphone public speech-amplifying equipment was installed at the ringside to enable announcements to be made to, and the progress of the fight followed by, the audience. Two microphones exactly similar in type to those used in the British Broadcasting Co.'s studios were used, together with eight "superloud speakers"; the latter were arranged in pairs on high poles.

Electricity Supply Workers' Wages.—The meeting of the National Joint Industrial Council for the Electricity Supply Industry, called for Friday last, lasted two days. Although no definite agreement as to wages was arrived at, it was evident that both sides were anxious to avoid drastic action, and as a result the tendering of the 14-days' strike notice was postponed, and a special "conciliation committee" of the Council was set up. The chairman of this committee was to be appointed by the Ministry of Labour, and the first meeting was to be held on Tuesday last, the result being communicated to the Council at the resumption of its meeting on the following day. On the same day (Wednesday) representatives of the executive councils of the trade unions involved were to meet at the Ministry of Labour.

The Leipzig Fair.—We have received from Mr. Charles Hennion, Jun., British representative of the Leipzig Fairs, Astor House, Aldwych, W.C.2, a prospectus of the Autumn Fair, which is being held from August 31st to September 6th. Among the subjects of the Fair are electrical machinery and appliances, radio apparatus, electro-technics, &c. Particulars of special travelling facilities, &c., accompanied the prospectus.

Leigh Fuel Contract.—The Leigh Town Council last week resolved to recommend the Electricity Committee to cancel the contract for fuel placed with Messrs. John Speakman and Sons, Ltd., so as to prevent the necessity of Alderman H. Speakman resigning. According to the *Bolton Evening News*, Alderman Speakman addressed a letter to the Council stating that in view of a decision in the King's Bench Division in the case of a Leeds alderman, he did not think it would be correct for him to take any further part in the deliberations of the Council until his position was made clear. The contract for the supply of fuel to the Electricity Department had, he understood, been sealed by the Council, but it had not yet been sealed by John Speakman & Sons, Ltd. If that contract should be completed, according to the Leeds decision, he might be disqualified as an alderman of the borough. He suggested that by mutual agreement between the Council and the firm, the contract should be cancelled, if, indeed, in the light of the Leeds decision, it could be regarded as a valid contract. Councillor Grundy said that Alderman Speakman had taken the only course open to him, and the Council decided as stated above.

New Zealand Government Contracts.—The Wellington correspondent of *The Times* states that a deputation of British manufacturers and agents has protested to the Prime Minister, Mr. Massey, against a part of the contract for the material for the Arapuni hydro-electric scheme going to Swedish firms. They alleged that this was a departure from the Government's previous policy. Mr. Massey replied that New Zealand desired to give every possible chance to British manufacturers. He would have been pleased if the whole contract could have been given to British workshops, but there was a difficulty with regard to part of the machinery, in which Sweden specialised. The expenditure upon Swedish work had been reduced to £64,000, out of a total of more than £1,100,000, which was a small proportion. It appeared to be impossible to obtain the required material elsewhere than in Sweden without calling for fresh tenders, which would involve serious delay.

Speaking on Imperial Preference generally, Mr. Massey said that some British manufacturers had not always treated New Zealand fairly. There was documentary evidence that some firms had made use of the depreciated currencies of Europe to have work done, and the material was then brought to England in order to claim the preference. New Zealand was not reversing her policy of preference, but it was hoped that the law would soon be altered to require an increased percentage of British workmanship.

Russian Notes.—*Railway Works.*—A further report has been placed before the National Commissariat of Communications with regard to the suggested conversion to electric traction of the suburban lines of the Moscow-Kasan and Northern railways. As a result of the growth in the traffic in the past year estimates have been prepared of the possible amount of traffic in 1932; these show the necessity for the electrification of the lines, the expenditure on which is computed at £1,200,000.

Industrial Consumption of Energy.—Reports have been presented to the Supreme Council of National Economy respecting the necessity for taking steps to secure a load for the regional stations which are expected to be completed in 1925 and onwards. According to one report an unfavourable impression has been created owing to the fact that out of the capacity of 6,000 kW of the new station recently opened at Kizeloff, the requirements of consumers so far only represent 300 kW. It is now proposed to form a special organisation to secure customers for the output of the new stations.

Swedish Activity.—It is reported from Moscow that the Allmanna Svenska Elektriska Aktiebolaget has entered into an agreement with the Volkhov station constructional department for the preparation of estimates, scheme, and consultation work in questions of a technical character. The firm has also applied for permission to carry on preparatory negotiations with other Soviet State organisations concerning the preparation of schemes for the financing or other forms of participation in works of electrification. As a result of the application the General Concessions Committee has registered the firm under the decree of April, 1923, for a period of one year.

Loans for Works.—The Electrical Bank has decided to grant loans amounting to 2,000,000 roubles for the work of electrification in Kharkoff. One-half is intended for the extension of the city station and the network, while the other half will be devoted to the re-equipment of the local tramway power station and the provision of from 35 to 40 new cars. All the new equipment to be provided will be constructed at works of the electrical trusts.

Electric Winder for the Kent Coalfield.—The ENGLISH ELECTRIC CO., LTD., informs us that it has received an order from Messrs. Pearson & Dorman Long, Ltd., for an electrically-driven winder, for the Snowdown Colliery, Kent. Messrs. Fullerton, Hodgart & Barclay, Ltd., will be sub-contractors for the mechanical parts. The winder will be designed to deal with an output of 144 tons per hour from a depth of 3,100 ft., the net weight per lift being 3 tons. The winding motor will be direct coupled to a winding drum of the cylindro-conical type, and will have a continuous rating of 2,300 b.h.p. at 61.2 r.p.m. This, it is claimed, will be the largest single self-ventilated motor operating a winder in this country, if not in the world. The control is to be on the Ward Leonard system, and a flywheel will be coupled to the converter set to reduce the peak loads on the power supply.

Trade Mark Change.—MESSRS. WARD & GOLDSTONE, LTD., ask us to announce that as they find that their trade mark for radio appliances, "Sonola," is very similar to a title used by an American gramophone house, they have decided to withdraw it and use in its place their registered title "Goltone."

Lighting and Power Notes.

Accrington.—YEAR'S WORKING.—The report of the engineer and manager of the electricity undertaking (Mr. A. W. Clegg) for the year ended March 31st last records a total income of £74,372, as compared with £81,377 in the previous year. Working expenses amounted to £37,863, as against £35,345, leaving a gross profit of £36,509 (£46,032), to which was added dividend on war loan amounting to £165, making a total of £36,674. After deducting capital charges, there was a net surplus of £12,839, as compared with £23,124 in 1922-23. The capital expenditure during the year, which included £9,964 for mains and services and £5,329 for machinery, amounted to £15,298. The sales of electrical energy amounted to 12,192,870 kWh, an increase of 2,419,279 kWh. The average cost per kWh generated fell from .868d. to .745d., and the average price obtained from 1.993d. to 1.459d.

LOAN SANCTIONED.—Sanction has been received from the Electricity Commissioners to the borrowing of £40,000 for plant extensions.

Australia.—MELBOURNE (VIC.).—The report of the Electric Supply Committee (chief engineer: Mr. W. H. Alabaster, M.I.E.E.) for the year 1923 records a total income of £437,905, as against £403,750 in the previous year. Working expenses totalled £276,406, as compared with £243,626, leaving a gross

profit of £161,499 (£160,124). After payment of capital charges, &c., a net profit of £26,102 remained—a decrease of £14,673. A total of 64,577,016 kWh was sold, an increase of 10,730,490 kWh. The total cost per kWh generated was 1.387d., and the average price obtained fell from 1.813d. to 1.638d. The total connections increased from 56,641 to 65,634 kW, and the number of consumers connected from 15,831 to 17,758. An agreement has been entered into with the State Electricity Commission for the transfer to the Commission of the Council's bulk supplies to adjacent municipalities. Arrangements have also been made with the Railway Commissioners for the supply of electricity to certain Government buildings, which will provide an estimated additional revenue of £4,500.

Batley.—Year's Working.—There was a net profit of £7,733 on the working of the Corporation electricity undertaking during the past year.

Belfast.—Power Station Grant.—Belfast Corporation received on August 14th a warrant for £150,000, being the final settlement of the arrangement made with the British Government in connection with the construction of the new power station. This sum represents the difference between the actual cost of construction and the expenditure that would have been incurred had the Corporation been free to select its own time for the erection of the station.

Bethesda.—Electricity Order.—The Urban District Council is applying to the Electricity Commissioners for an Order authorising it to obtain a bulk supply of electricity from the North Wales Power Co. for distribution in the district.

Bexhill.—Year's Working.—As reported in our issue of June 6th, the working of the electricity undertaking for the year ended March 31st last resulted in a net profit of £959. The report of the borough electrical engineer (Mr. C. A. Frost) which has come to hand, shows that the sales of energy increased by 206,945 kWh to 1,244,774 kWh, and the average price per kWh obtained fell from 6.3d. to 4.76d. During the year a new Babcock & Wilcox boiler and new Allen condensing plant were installed. In January last it was recommended that two small Allen reciprocating sets should be replaced by a 1,250-kW geared turbo-generator, but the Electricity Commissioners suggested that the cost of obtaining a bulk supply from Hastings should be ascertained before they sanctioned the scheme. The engineer reports that so far investigations tend to prove that the Council could generate energy cheaper than it could buy it in bulk.

Chester.—Electricity Supply.—The Electricity Committee is engaged in converting the old Crane Street generating station to a sub-station for the distribution of energy received from Queen's Ferry power station. At the Crane Street station, electricity will be transformed from 33,000 V to 6,600 V.

Crook (Co. Durham).—"Free-Wiring" System.—The Urban District Council has approved a scheme submitted by the electrical engineer for the "free wiring" of houses, and application has been made to the Electricity Commissioners for sanction to a loan of £1,000 for the wiring of 100 houses.

Derby.—New Plant.—The Town Council has decided to install two new boilers at the electricity works at a cost of £30,000. The "Lopulco" powdered fuel system will be used.

India.—Hydro-Electric Development.—According to *The Times Trade and Engineering Supplement*, a new company, known as the Trichinopoly Electric Power Co., has been recently formed to develop the water power of part of the Kollimalai Hills in the Salem district. The power generated will be utilised for the manufacture of sulphuric acid and super-phosphate manures from the large natural deposits of sulphur and the phosphatic rocks in the vicinity. The capital of the company is Rs.20 lakhs. Two other hydro-electric projects are being investigated by the Madras Government; one for harnessing the waterfalls of the Kindipuyd River at Mannarghat, South Malabar, which, if successful, will develop 30,000 h.p.; and the other for harnessing the Papanasam Falls in the Tinnevelly district. The Papanasam Falls scheme would help to develop the Indian paper industry.

Irish Free State.—Cookstown (Co. Tyrone).—The local Electric Light and Power Co. and the Gas and Light Co. have tendered for the public electricity supply, the former offering electricity at 8½d. per kWh, and the latter at 10d. per kWh, less 20 per cent. for every three months, or 50s. per lamp per annum. The Electric Light and Power Co., however objected to certain conditions sought to be imposed, and asked permission to erect the street poles. The Urban District Council has not yet given any decision.

Clonmel (Co. Tipperary).—The Corporation proposes to introduce an electricity scheme for the town at an estimated cost of £20,000. Steps are being taken to secure an Electricity Order, and it is hoped that the power station will be in operation towards the end of the present year.

Morocco.—Electrical Development.—A Bordeaux correspondent states that a steam power station having three turbo-alternators of 6,000 kW each is in course of construction at Casablanca, and will be completed by the end of this year. A hydro-electric station is to be built at Si Said Machou on the Oum-er-Rebia, about 30 miles from the mouth of this river; the plant will comprise four turbo-alternators of 5,000 kW each. It is also stated that other electricity works are projected.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Loughborough.—Lighting: From 7d. to 6d. per kWh.

Perth.—Lighting: From 5½d. to 4½d. per kWh. Heating: From 1½d. to 1¼d. per kWh.

Sheffield.—The percentage increase for all energy over 2d. per kWh to be reduced from 20 to 15, and for electricity at 2d. per kWh or under, from 40 to 30.

Reigate.—Loan Sanctioned.—The Town Council has received the sanction of the Electricity Commissioners to a loan of £5,000 for mains, plant, &c., for the electricity works.

Sheffield.—Progress of Electricity Undertaking.—The Electric Supply Committee has submitted a report to the Town Council on the progress of the electricity undertaking. The sales of energy per annum have increased from 26,000,000 kWh in 1914 to 152,000,000 kWh, the number of consumers from 6,225 to 19,739, and the revenue from £127,921 to £896,732. Arrangements have been made for the provision of an interconnecting link with the Rotherham power station to meet the anticipated increased demand for electricity during the coming winter. For the requirements of the following winters the new power station at Blackburn Meadows is being proceeded with, and further plant, with a capacity of 20,000 kW, will be installed, bringing the total capacity of the plant to 123,000 kW.

Stockport.—Loan.—The Town Council has decided to apply to the Electricity Commissioners for sanction to the borrowing of £90,000 as the first instalment for extensions to the plant at the Millgate electricity works. The estimated total of a second instalment to be applied for is £80,000.

Tonbridge.—Loan.—The Urban District Council has applied to the Electricity Commissioners for sanction to a loan of £3,500 for mains.

Warwickshire.—Special Order.—The Midland Electric Light and Power Co., Ltd., has applied to the Electricity Commissioners for a Special Order authorising it to supply electricity in certain parishes within the rural districts of Southam and Warwick.

Whitchurch.—Special Order.—Application has been made to the Electricity Commissioners by Messrs. A. Stevens & Sons for a Special Order authorising them to supply electricity in certain parishes in the rural district.

Winchester.—Year's Working.—The report upon the city electricity undertaking (engineer: Mr. R. Ayton) for the year ended March 31st last records a total income of £32,171 and a working expenditure of £19,680, as compared with £31,273 and £20,671 respectively in the previous year. The gross profit was thus £12,491, as against £10,602. After appropriating £8,330 for loan redemption and interest and £1,380 for other purposes, there was a net profit of £2,781, as compared with £2,833 in 1922-23. The capital expenditure during the year, which included £6,199 for machinery and £3,551 for mains and services, amounted to £11,863. The sales of electrical energy increased from 1,729,663 to 1,950,208 kWh, the maximum supply demanded from 871 to 992 kW, and the total connections from 4,344 to 4,698 kW.

Tramway and Railway Notes.

Canada.—Railway Electrification.—According to the *Journal of Electricity*, Mr. D. C. Coleman, vice-president of the Canadian Pacific Railway Co., recently announced that studies and surveys in connection with the proposed electrification of the company's line from Lake Louise to Revelstoke are being made, and it is hoped that definite plans will be completed within a few months.

Japan.—Railway Electrification.—According to *Commerce Reports*, the electrification of the Tokaido railway between Tokio and Akashi has been approved by the directors of the divisions making up the entire railway system of Japan. The work under consideration at present consists of the portion of the Tokaido line extending from Numazu to Akashi, a distance of approximately 300 miles. This work, not including the cost of locomotives, is estimated to require the expenditure of about 21,983,000 yen. It has been decided to operate at 1,500 V d.c., with single catenary overhead construction, fed from approximately 25 sub-stations. It is estimated that approximately 80,000 kW will be required to operate the system, which power will be purchased from private companies for the time being, though ultimately the Government railways will construct a hydro-electric plant on the Tenryu river with a capacity of 65,000 kW. Work will begin early in 1925 on the section between Nagoya and Kyoto, and should be completed by the end of 1926. It is probable that electrification of the Hakone section between Kozu and Numazu will also be carried out during the same period, and the electrification of the entire Tokaido line is scheduled for completion by the end of 1928. In addition to the electrification of the Tokaido line, the Railway Department has already prepared tentative plans for electrifying both the Central and the Northern lines. In connection with this work, it is reported by the Bureau of Electrification that it is proposed to increase the capacity

of the hydro-electric station now under construction on the Shinano river from 65,000 kW to 110,000 kW. This plant will eventually be used for supplying power to the Northern line, for which it is expected definite electrification plans will be submitted at the next conference of division directors of the Imperial Government Railways.

Newcastle-on-Tyne.—PROPOSED NEW ROUTE.—The Transport and Electricity Committee has under consideration an alternative route from the west end of the city to relieve the pressure on the Westgate Road route. The doubling of the track on the east side of Gosforth Park is also proposed.

Uruguay.—RAILWAY ELECTRIFICATION.—The National Administrative Council has approved the proposal for the electrification of the Northern Tramway Co.'s system.

West Ham.—YEAR'S WORKING.—The accounts of the municipal tramways for the year ended March 31st last record a total income of £251,473, as against £290,759 in the previous year. Working expenses were lower by £2,431 at £245,412, leaving a gross surplus of £6,060 (£42,596), to which was added the sum of £355, being capital charges on cables, and bank interest of £449, making a total of £6,865. Capital charges absorbed £29,860, and £34,805 was spent out of revenue for reconstruction of track and car bodies, leaving a net deficit of £57,800, as compared with a deficit of £24,690 in 1922-23. The working costs per car-mile decreased from 16.581d. to 16.540d., and the income per car-mile fell from 19.450d. to 16.946d.

Telegraph and Telephone Notes.

Atlantic Cables.—DIRECT CANADIAN SERVICE.—A new direct telegraph cable service between Montreal and London was inaugurated on August 15th by the Anglo-American Telegraph Co.—*Reuter.*

India.—NEW RADIO STATION.—A company under the name of the Indian Radio Telegraph Co., Ltd., with a capital of 30,000,000 rupees, has been registered in India for the purpose of erecting a large radio station near Bombay, to be connected with the Imperial chain. Messrs. F. M. Chinoy & Co., of Bombay, are organising the enterprise, and have obtained all rights from Marconi's Wireless Telegraph Co., Ltd., London. The company has applied to the Indian Government for a licence to erect the station, which it is understood will be granted some time during the latter part of the current year; the station is expected to be completed before the end of 1925. Mr. Sultan M. Chinoy, a member of the board of directors of the company, is to visit the United States during the latter part of September or the first part of October to purchase the necessary equipment.—*Commerce Reports.*

Madeira.—RADIO STATION SHUT DOWN.—It is reported that the Funchal radio station is not working owing to a machine having burnt out, and that a date cannot be given for the re-opening.

New Zealand.—TELEGRAPH SURPLUS.—In the last fiscal year the New Zealand Post and Telegraph Department had a surplus of revenue over expenditure of £568,000.

Pacific Cables.—RATE REDUCTION.—The Pacific Cable Board and the Eastern Extension Co. have definitely agreed to a reduction of the cable rates between the United Kingdom and Australasia of one-sixth of the existing rates, beginning on December 1st. It is understood that the reduction applies to ordinary, Press, and deferred rates. A reduction of 1s. would show a diminished revenue of £40,000, and the Commonwealth proposes to remit only 1d. from the terminal rate of 5d.—*Daily Telegraph.*

Sweden.—NEW RADIO STATION.—It is expected that the Grimeton radio station will be completed early in October. Four masts out of six are now finished and the station will be opened for traffic by the end of the same month.—*Reuter's Trade Service* (Stockholm).

The Telephone Service.—USERS' ASSOCIATION.—The Telephone Users' Protection Association, formed a few months ago with the main object of securing a cheaper and more efficient telephone service, is preparing an agreement to replace the present one, which it is contended is one-sided. Counsel's opinion is to be taken, the proposed agreement is to be submitted to the Postmaster-General, and questions will be raised on the subject in Parliament. The Association is preparing a comprehensive comparison of American and British systems.—*Morning Post.*

West Indies.—NEW CABLE LAID.—The laying of an "all red" cable between Georgetown (British Guiana), Barbados, Trinidad, and Turks Island has been completed. According to *The Times*, the shore stations are being equipped and within the next two months the service will be opened, thus bringing Jamaica, Bermuda, and Halifax (Nova Scotia) in direct communication with three of the Eastern Caribbean colonies.

Radio Notes.

Australia.—BROADCASTING REGULATIONS.—It was expected that the final new regulations for radio-broadcasting would be issued on July 1st last. It is understood that a company, with a capital of £200,000, will be formed to broadcast in all the States. The new company will compensate existing broadcasting companies, and will collect and pay to the Commonwealth all licence and other fees, and part of the profits will be devoted to the improvement of programmes and to research. The licensing fees will be substantially increased.

The Associated Radio Co. has decided to issue a Supreme Court writ against the Federal Government for £100,000 damages in the event of the new regulations, providing for compulsory amalgamation into one big broadcasting monopoly, being enforced. The company, which is the only one at present operating in Victoria, was to close down as soon as the regulations come out, and then issue the writ.

NEW STATIONS.—The broadcasting station erected by Amalgamated Wireless, Ltd., for Westralian Farmers, Ltd., was recently opened by the Premier of Western Australia (Mr. Collier). The new station, 6 WF, is in Perth, and comprises a ½-kW transmitter manufactured at the A.W.A. Radio Electric Works in Sydney. The present set will be replaced at an early date by a 6-kW transmitting set. The masts, weighing some 3½ tons, are erected on top of the company's building, and rise 110 ft. above the roof. Two studios are provided. The South Australian Radio Co. has bought the Manchester broadcasting station for £12,000. It will be erected in Adelaide, and will relay concerts from Europe.

Ceylon.—BROADCASTING.—The Ceylon Government has sanctioned the purchase of suitable equipment for broadcasting purposes, and steps are being taken to procure it.—*Daily Mail.*

Radio-Broadcasting.—HULL RELAY STATION.—A new relay station was opened by the British Broadcasting Co., Ltd., at Hull on the 15th inst. Its call signal is 6 KH, and the wavelength 320 metres.

LICENCE REVENUE.—The financial accounts for the United Kingdom for the year ended March 31st, 1924, issued as a Blue-book, record that the revenue from the sale of radio licences amounted to £497,404.

AERIALS.—The National Federation of Property Owners has taken legal opinion on the rights of tenants to place poles for radio aerials on the property they rent, and the president, Mr. E. J. Churchman, of Manchester, states that counsel advises, in effect, that the owner cannot prevent the tenant from putting up poles or attaching radio apparatus to a house, but if the tenant does damage in doing so, then he is liable as for damage done in other circumstances.—*Daily Mail.*

LONG-DISTANCE RECEPTION.—The B.B.C. London station (2 LO) concerts have been received in Algiers, North Africa, where the high-power Chelmsford station (5 XX) has also been heard; the latter station has, moreover, been heard in Denmark, in all cases on a crystal receiver clearly and at good strength.

South America.—BROADCASTING PLANS.—The adoption of a new programme for the promotion of radio-broadcasting in Latin America by American interests following the abrogation of an agreement under which the American companies had jointly participated in South American radio business for the past three years with England, France, and Germany, was announced on July 24th by General J. G. Harbord, president of the Radio Corporation of America, who said the new plans gave the United States its first unrestricted opportunity to utilise fully its resources in developing radio in South America, and five of the principal countries of the continent, Argentina, Uruguay, Chile, Venezuela, and Brazil will benefit. The plans not only include a change in the system of distributing merchandise, but involve the introduction of a practical method for supporting broadcasting, which will be first applied as a trial to the station at Buenos Aires.—*T. & T. Age.*

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Argentina.—BUENOS AIRES.—October 27th. Ministry of Public Works. 25 steam travelling cranes and 1 stationary electric crane.*

Ashton-under-Lyne.—August 25th. Tramways Committee. Nine single-deck and one double-deck railless trolley vehicles. Mr. C. L. Baker, general manager.

Australia.—MELBOURNE.—October 20th. Agent-General for Victoria. Morwell power scheme. Specification No. 24/68, 22,000-V insulators. (August 8th.)

BRISBANE.—September 1st. City Electric Light Co. 150,000-V testing transformer.

Bedford.—September 3rd. Electricity Department. E.h.p. and other transformers. (August 15th.)

Belfast.—September 8th. Electricity Department. One electrically-driven passenger lift. Specifications from Mr. Johnstone Wright, city electrical engineer.

Belgium.—September 16th. Municipal authorities of Antwerp. Installation of two electric motors and centrifugal pumps at the hydraulic station at the Kattendyk. Specifications from Hotel de Ville, Antwerp, for 2½ fr.

September 8th. Députation Permanente de la Province de la Flandre Occidentale, at Bruges. Establishment of an electricity distribution system at Ostend, Nieuport, and Coxyde. Particulars obtainable from 99, Rue des Flamands, Louvain.

September 3rd. Municipal authorities of Wenduyne-sur-Mer, Western Flanders. Installation of a transformer station; also the supply of the cables and electric motors for the municipal water-pumping station. Particulars for 10 fr.

Bolton.—September 6th. Board of Guardians. Electric lighting installations at Fishpool Institution, the Hollins Cottage Homes, and the Townleys House, Farnworth. Specifications from Mr. John Ward, architect to Board of Guardians, 24, Mawdsley Street, Bolton.

Canada.—TORONTO.—September 16th. City Council. One 40 million-gallon centrifugal pump and electric motor, or two 20 million-gallon pumps and motors.*

Dublin.—August 27th. Port and Docks Board. Two 2-ton electric wharf cranes. Mr. Joseph Mallagh, engineer to the Board, East Wall, Dublin.

Eccles.—August 25th. Electricity Committee. One 160-kVA, three-phase oil-cooled transformer. Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft.

Edinburgh.—September 1st. Electricity Supply. One 10,000-kW turbo-alternator with surface condenser and duplicate set of air- and water-extracting pumps. (August 8th.)

August 30th. Tramways Department. Six complete top-covered car bodies. Specifications from the tramways manager, 2, St. James's Square, Edinburgh.

September 8th. Electrically-driven pumps, with switchgear, &c., and electric locomotive grab crane, &c. (See this issue.)

Faversham.—September 1st. Electricity Department. Rearrangement of the existing switchboard and supply and installation of new switchgear. (August 15th.)

September 6th. Electricity Department. Water cooling tower, motor-driven centrifugal pumps, and centrifugal oil purifier. (See this issue.)

Haslingden.—September 5th. Haslingden, Rawtenstall, and Bacup Outfall Sewerage Board. Alterations and additions to machinery. (August 15th.)

India.—September 1st. Madras Corporation. Five miles twin 7/.048 and two miles twin 7/.064 paper-insulated, lead-covered and steel tape armoured cable suitable for pressures up to 660 V a.c.

London.—ST. PANCRAS.—August 26th. Electricity Department. E.h.p. switchgear. (August 15th.)

H.M. OFFICE OF WORKS.—September 2nd. 150-kVA motor alternator set, &c., at the National Physical Laboratory. H.M. Office of Works (Contracts Branch), King Charles Street, London, S.W.1.

Manchester.—August 28th. Electricity Committee. Electrically-driven air compressor plant and pipework, pipework for high- and low-pressure drains, and five 125-kVA, two 250-kVA, and three 500-kVA transformers. (August 8th.)

August 26th. Tramways Committee. Supply of copper bonds for tramway rails. Mr. Henry Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly.

Morley.—August 25th. Town Council. Electrician's work required in erection of 48 houses, Middleton Road site. Plans and specifications may be seen at Borough Engineer's Office, Town Hall.

New Zealand.—WELLINGTON.—October 28th. Switchgear, including 6,600-V oil switches, for the Lake Coleridge Power Scheme.*

CHRISTCHURCH.—October 21st. City Council. Electrically-driven pumping plants. (Ref. A X 1,220).*

October 7th. Taranaki Electric Power Board. Transformers. (Contract No. 43.)*

WAIRERE.—Electric Power Board. October 7th. Small hydro-electric plant.*

Oldham.—August 25th. Board of Guardians. Electric lighting installation at the Union Buildings, Rochdale Road. Specifications and forms of tender from Messrs. C. T. Taylor and Roberts, architects, 10, Clegg Street, Oldham.

Port Talbot.—September 3rd. Borough Council. Electricity generating plant, underground mains, transformers, and meters. (August 8th.)

Rathmines.—August 27th. Rathmines and Rathgar Urban Council. 1,000 yd. of cable. Town Clerk, Rathmines, Dublin.

South Africa.—JOHANNESBURG.—September 10th. Municipal Council. H.p. cubicles.

September 8th. Electricity Supply Commission. Establishment and working of an undertaking in the Witbank district of the Transvaal Province for the supply of electricity to the Victoria Falls and Transvaal Power Co., Ltd., and consumers within a 15-mile radius of the proposed generating station. The undertaking is to include, in the first instance, a generating station of 60,000-kW capacity. Tender forms (£10 10s.) and particulars from the Electricity Supply Commission, 82, Marshall Street, Johannesburg.

September 15th. South African Railways and Harbours. Electric cables and wires for 12 months. Incandescent electric lamps.*

STELLENBOSCH (CAPE PROVINCE).—September 5th. Municipal Council. Complete electric lighting and generating plant.*

Stalybridge.—August 25th. Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board. Structural steelwork required in erection of new Hartshead power station. Specifications, &c., from Messrs. W. H. George & Son, architects, 7, Warrington Street, Ashton-under-Lyne.

Warrington.—September 1st. Electricity Department. Twelve months' supply of earthenware conduits. (August 15th.)

West Ham.—September 8th. Tramways Department. Six double-deck electric tramcar bodies, with totally-enclosed roof covers; 6 car sets of centre-bearing swing bolster trucks. Mr. L. Slattery, general manager, Greengate Street, Plaistow, E.13.

*Further particulars can be obtained at the Department of Oversea Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—MELBOURNE.—City Council. Accepted:—
1,200 a.c., 2-wire meters (£1,710).—Lascelles, Parrington, Ltd.

SYDNEY.—City Council. Accepted:—
H.p. isolating switches for feeder protective apparatus (£334).—Oscar Harvey & Co., Ltd.
Additional h.p. feeder panel (£410).—A. Reyrolle & Co., Ltd.
*Flexible coupling for connecting turbine and alternating spindle (£588).—English Electric Co. of Australia, Ltd.
*New rotor for the 12,000-kW turbo-alternator (£4,500).—Metropolitan-Vickers Electrical Co., Ltd.
*Spare parts for 12,000-kW turbo-alternator (£1,387).—British General Electric Co., Ltd.
*Spare parts for 17,000-kW turbo-alternator (£4,144).—Metropoltan-Vickers Electrical Co., Ltd.
*Three impellers for air extraction (£262).—Metropolitan-Vickers Electrical Co., Ltd.
*After the contracts had been passed by the Council, notice to rescind acceptance was given.

Metropolitan Water and Sewerage Board. Accepted:—
4 electrically-driven centrifugal pumps and spares (£932).—A. Smashall.

Postmaster-General's Department, New South Wales.
156 miles enamelled insulated flame-resisting wire (£1,560).—British General Electric Co., Ltd.
1,650 strip protectors mounted in strips of 20 (£3,280); 2,475 strip fuses mounted in strips of 20 pairs (£2,383); 13,100 telephone cords, various lengths (£1,094).—J. B. Wallis, Ltd.

STATE ELECTRICITY COMMISSION OF VICTORIA.
66,000-V disconnecting switches and lightning arresters (£1,455).—Australian General Electric Co., Ltd.
Two 50-kVA transformers (Swedish manufacture) (£540).—Thomas Bros. Pty., Ltd. —*Tenders.*

KIAMA.—Municipal Council. Accepted:—
Poles (£3,868).—Ramsay, Sharpe & Co.
D.c. transformers and h.p. switchgear (£743); transformers (£326).—Electrical Plant Manufacturers Pty., Ltd.
Meters (£4,802).—Electricity Meter Manufacturing Co.

Belgium.—French, Belgian, and Czecho-Slovakian concerns competed last week for a Belgian Post and Telegraph contract for the supply and laying of a quantity of telephone cables at Lierre, Boom, and Cappelen. The lowest offer, however, was that of a home concern—The Société des Ateliers de Constructions Electriques de Charleroi.

Two Belgian concerns and one each Danish and Czecho-Slovakian competed last week for a Belgian Post and Telegraph Department contract for the supply of 90 kilometres of light cable. The lowest offer was that of the Danish firm, the Nordiske Kabel og Draatfabriker, of Copenhagen.

Dartford.—Urban Council. Accepted:—
Cable and switchgear (£2,940) for the supply of electricity to the West Kent Main Sewerage Board.—Johnson & Phillips, Ltd.

Dublin.—Electricity Department.
The following firms submitted tenders for the supply of cables, troughing, section pillars, disconnecting boxes and service boxes for a period of one year, viz.:—Ateliers de Construction Electriques de Charleroi; British Insulated & Helsby Cables, Ltd.; Siemens Bros. & Co., Ltd.; Deutsche Kabelwerke A.G.; Chapman & Chapman (for A.E.G., Berlin); Western Electric Co., Ltd.; Pirelli-General, Ltd.; Johnson & Phillips, Ltd.; Enfield Cable Works, Ltd.; W. T. Glover & Co., Ltd.; and Callender's Cable and Construction Co., Ltd.

For section pillars, disconnecting boxes and service boxes, the lowest prices tendered were those of the British Insulated & Helsby Cables, Ltd.; and for troughing the prices of the Hammond Lane Foundry Co. were the lowest. The tenders of these firms are recommended for acceptance by the Borough Commissioners.

The tender of the Ateliers de Construction Electriques de Charleroi is the lowest for most of the items under the heading of h.p. and l.p. cables, while the present contractors, the British Insulated & Helsby Cables, Ltd., are the next lowest. In view of the substantial difference between the prices of these two firms, and having regard to the great satisfaction which the last-named company's products have afforded the Corporation during 20 years, the Commissioners authorised the City Electrical Engineer to visit the Belgian company's works in order to ascertain the technical reputation and standing of the firm. As a result of the visit, the Electrical Engineer stated that he saw no reason to doubt the ability of this firm to supply a good cable.

Owing, however, to the fact, that the time for delivery in the case of the Belgian firm's cables would be about twice as long as that of the British Insulated & Helsby Cables, Ltd. (and that emergencies sometimes arise when delivery is more important than price), Commissioner P. J. Hernon recommends that:—(a) The contract for 11,000-V cables (of which probably none will be required) be placed with the latter firm; (b) the 5,000-V cables—approximate value if North Wall cables be not laid, £3,000; if they be laid, £17,000—be purchased from the Ateliers de Construction Electriques, and also from the British Insulated & Helsby Cables, Ltd., if the latter company will supply, in case of necessity, at the A.C.E. firm's prices; (c) the l.p. cables (approximate value, £1,000-£2,000) be purchased on the same basis as set out in (b). For the 11,000-V cables in (a) the prices of the two firms mentioned are practically the same. In the case of (b), for the 5,000-V cables (plain lead covered), the British firm's prices average about 13 per cent. higher than those of the Charleroi firm. For the l.p. cable, plain lead covered, the former firm's tender averages about 20 per cent. higher; while for l.p., armoured, there is a difference of 33 per cent. in favour of the quotations of the A.C.E. company.—*Irish Builder and Engineer.*

Mr. Hernon, one of the Dublin Borough Administrative Commissioners, has reported favourably on the recommendation of Mr. L. J. Kettle, city electrical engineer, for acceptance of the tenders of the Western Engineering Co., Liverpool, for the electrical wiring of 332 houses at Fairbrother's Fields, a working-class district, at £3,620; and that of the City Electrical Department for the wiring of 231 similar houses in the Marino area, at £3,250 or £2,550, for C.M.A. or Continental cable alternatively.

Hull.—THE RAIL CONTRACT.—The *Electric Railway and Tramway Journal* states that the Lord Mayor of Hull has received a notice of motion to rescind the resolution accepting the tender to supply rails made in Germany.

North Bierley.—Joint Hospital Board. Accepted:—
Installing electric light.—Southern & Co., Bradford.

Saffron Walden.—Town Council. Accepted:—
Plant (£1,860).—Read & Partners.
Distribution system (£2,771).—Craven and District Electrical Construction Co.
Power station (£997).—W. Bell & Sons.

Stafford.—Board of Guardians. Accepted:—
Installing electric light at the workhouse (£236).—W. Hampton.

Thornley.—The Parish Council has accepted, out of four tenders received, the tender of Reid, Ferens & Co. for laying an underground cable for street lighting.

West Mersea.—Weaver Tidal Power Syndicate, Ltd.—The daily Press states that the above syndicate has placed a contract with the Power Construction Co., Ltd., for the construction and installation of a hydro-electric power plant to be at West Mersea, Essex, which will be operated by the rise and fall of the tides. This site has been selected on account of its natural facilities, and also because the towns in the neighbourhood, including Colchester and Southend, will ensure a large demand for the electricity generated. Work has already been started, the first portion of plant being designed to generate over 4,000,000 kWh per annum. When the entire scheme has been completed, it is estimated that over 15,000,000 kWh will be produced each year.

Whitby.—Urban Council. Accepted:—
Cable, &c., for the Ruswarp scheme (£4,710).—Callender's Cable & Construction Co., Ltd.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

A skeleton type metal carrier for small accumulators.
PANALITE insulation.

Notes.

Six-wheeled Kerb-side Controlled Electric Vehicle.—The first electrically-driven six-wheel vehicle designed for refuse collection and built by Richard Garrett & Sons, Ltd., of Leiston, for the City of Norwich Health Department has recently been delivered. Hitherto four wheelers of 5 and 2½ tons capacity have been used at Norwich, the acquisition of the six-wheeler, which has a capacity of 16 cubic yards, being somewhat of an experiment. The vehicle is a combination of a two-wheel trailer with a four-wheel tractor. The latter is practically a standard Garrett 5-tonner with a short wheelbase. Its single series-wound 11-b.h.p. motor is supplied from a battery of 44 Ironclad-Exide cells. A feature of the vehicle is that it is arranged to be steered and controlled either from the driver's seat as usual or from the kerbside. For the kerbside control the steering wheel is removed from the steering column and placed on the end of a horizontal shaft projecting from the off-side of the driver's cab and independently controlling the steering mechanism. Here also are hand levers for independently operating the current controller and the trailer brake. The vehicle, which measures 25 ft. in length overall, is able to maintain a speed of 13 miles per hour, and can round a curve of 22 ft. radius.

Fatality.—William Snelling, of Thornaby-on-Tees, Yorkshire, was killed by coming in contact with overhead electric wires while helping to take down an Army stable at the Catterick Camp on August 12th.

Electric Railway Signals.—The Metropolitan Railway Co. has brought into use at Baker Street Station, London, a new signal-box operated entirely by electric power. It will control the movement of 1,774 trains daily, permit of greater flexibility of traffic, and materially increase the handling capacity of this important station. An illuminated diagram in the signal-box informs the signalman of the position and movement of every train within a three-mile zone. The power frame comprises forty-five levers, operating twenty-one sets of points, thirty-five signals, and eleven route indicators. The power-worked points have also been reorganised; whereas three sets took seven and a half seconds to operate in the past, they can now be operated in two and a half seconds. Each point and signal lever is fitted with electric locks controlled by passing trains. A spacious relay and fuse room has been provided, containing track indicating relays, three-position point indicating relays, &c.—*Daily Telegraph.*

Within the last few weeks the outlying junction near Charleville, Irish Free State, where trains for Limerick leave the main Cork to Dublin line, has been fitted with apparatus which enables the signalman at Charleville to set the points at the junction for either the main or branch line electrically. Electricity for moving the points and for operating the signals is generated by the signalmen and transmitted by overhead wires to electric motors at the junction points. Each motor moves its own set of points to the desired position, and indicates back to the signal cabin when its function is completed. The installation is the first of its kind on the Great Southern and Western Railway, the apparatus having been manufactured by the Westinghouse Brake and Saxby Signal Co. specially.—*Irish Times.*

Mersey Magnetic Disturbance.—Mr. A. O. P. Warner, general manager of the Docks Board, in a warning to mariners, makes announcement:—"A circular area of magnetic disturbance, with a radius of about 100 yards, which is likely to cause oscillations of the magnetic needles of ships' compasses, has been located on the Mersey Bar. The centre of the area is approximately East mag.—about 540 yards from B1 Pillar Buoy. Mariners must be cautious in passing over this area."—*Financial News.*

Steering Ships by Radio.—Known methods of steering ships radio electrically are claimed to have been improved upon by an Italian engineer, Mr. Ermanno Fiamma, who a month ago is declared to have carried out satisfactory tests at Spezia in the presence of representatives of the Ministry of Marine. According to the inventor's statement, his chief improvement is that the instruments devised by him are not affected by atmospheric disturbances or radio-electric interference. He made satisfactory experiments last year at Spezia, says the *Daily Telegraph*, whereupon the Minister of Marine delegated a special commission to make new observations. The third and final series of experiments were made last month in the presence of this commission. A submarine chaser was placed at his disposal, and a destroyer manœuvred at a distance of ten miles, sixty different commands being given and satisfactorily executed in heavy weather. The chaser was made to leave port and proceed in various directions, at a speed of 20 to 30 knots, being absolutely under the control of the engineer in charge of the operations on board the destroyer.

Manchester Electro-Harmonic Society.—The Society opens its sixth session on Friday, October 17th, with a concert at the Albion Hotel, Piccadilly, Manchester, commencing at 7 p.m. The artistes for the first concert will be:—Miss Doris Kloet (soprano), Mr. Horace Brown (tenor), Mr. C. Collier (harpist), and Mr. Ernest Cookson (solo pianist and accompanist).

Balancing High-Speed Rotating Elements.—With the advent of larger and higher-speed turbines, the attainment of dynamic balance has been a difficult problem. After long investigation a balancing machine has been produced by the Westinghouse Co. (U.S.A.) which is highly satisfactory for obtaining both static and dynamic balance for all sizes of turbine and generator rotors. The machine consists of two pedestals mounted on rigid bed rails, a driving motor, a special magnetic clutch, and a complete lubricating system. The rotor is supported at each end by two self-aligning pad bearings which are in turn supported by an inverted pendulum. The lower half of the pendulum is stayed transversely by a flexible tie rod, and the upper end is supported on both sides by adjustable springs which give the system the desired frequency. Geared stop screws, operated by a hand wheel, permit either pendulum to be locked in a position of alignment with the driving motor and clutch. A magnetic coupling is used to enable the spindle to be disconnected from the driving rotor while running. It consists of a hollow disk, inside of which is an annular magnet. A light steel adapter plate is coupled to the spindle shaft. The magnetic disk, which is designed for endwise movement, is moved up to and against this adapter plate and its magnet energised. A positive coupling is thus established which can be broken at will by breaking the circuit to the magnet and shifting away the adapter plate. The spindle is made to revolve at a speed in synchronism with the natural period of vibration of the support and its load, which period can be changed by using different scale springs. The procedure for balancing is to first operate the spindle at the synchronous speed, keeping the pendulum rigid at one end and free at the other. Weights are placed in tapped holes drilled in the end of the spindle at equidistant points for balancing purposes only. The magni-

tude and location of the weights are determined by experiment until the deflection on the indicator is reduced to the desired amount. The same process is repeated for the other end. The addition of a weight causes a slight unbalance on the end first tested. This variation may be adjusted by the application of simple formulæ, which will enable the amount of the supplementary weights to be added on each end to be calculated. The accuracy of the balance obtained is such that the addition of 14 grammes at a 163-cm. radius could be unmistakably detected on a rotor which weighed 104,500 kg. This corresponds to a precision of 1/7,500,000 of a gramme per gramme of rotor at a 163-cm. radius.

Gas-lit Railway Coaches.—According to *Modern Transport*, as a result of the Bellinzona accident in April, which was aggravated by the fact that a German gas-lit coach took fire, gas-lit coaches and goods vans have been forbidden on the Swiss railways. The French Government took similar action some years ago.

Inquest.—An inquest was recently held at Penrhiwceiber into the death of Idris Erasmus, an electrician, at the Penrikyber Colliery, South Wales. A fellow electrician stated in evidence that he, the deceased man, and two others were instructed to inspect two electrical joint boxes. They went to the sub-station to carry out the work when witness heard a cry from the foreman to cut off the power. After cutting off the power witness found Erasmus lying over one of the joint boxes. Artificial respiration was tried without success. Witness said that the deceased must have received a shock at 750 V; deceased must have omitted to cut off the current before commencing the work of untaping the joint in the box. The Coroner, in recording a verdict of "Accidental death," said that there was no responsibility upon anyone else to cut off the current; deceased must have acted absent-mindedly.

"Coal and Power."—In a pamphlet issued by the Mining Association of Great Britain, Mr. Lloyd George's "Coal and Power" report is subjected to severe criticism. The report is condemned as mere political propaganda, and it is said that the British mining industry is efficiently managed and it is not likely to be improved nor the price to the consumer lowered by the semi-nationalisation proposed by Mr. Lloyd George. Coming from such a source, the pamphlet, naturally, does not deal with the electrical side of the proposals in the report.

Electricity in Oilfields.—The *Journal of Electricity* reports that the Midwest Refining Co. of Salt Creek, Colorado, is extending its electrical pumping plant. Natural gas is used as fuel for the steam boilers in a 25,000-kW plant which distributes energy over an area of six miles radius. The adoption of electrical pumping has resulted in a greatly increased output. In fact, it is said that the daily production of one well has been increased from 60 to 700 barrels.

An Exhibition of Inventions.—During last week an exhibition was held under the auspices of the Institute of Patentees at Aldwych House, Kingsway, in which a number of novel inventions appeared. In the electrical section, which was but a small part of the exhibition, there was an improved type of distributor for use with the coil ignition system of internal combustion engines. All the wires in this are enclosed, and only high-pressure and earth plug leads are necessary. There was also an improved feed water heater, consisting of two cylindrical vessels divided into compartments and connected by tubes in such a manner as to ensure proper circulation. The Bower rectifier and battery charger shown has a tuned reed close to a core, round which are wound two coils. One is in shunt with the output and the other with the secondary of a transformer which reduces the mains pressure to about 10 V. When the polarity of the output is the same as that of the transformer output the magnetism of the core is neutralised and the reed springs back and makes contact.

Another exhibit was the "Unidyne" valve circuit, which does not require a separate h.p. battery. This employs a four-electrode valve which is coupled up so that the outer grid is the control grid and is in the aerial circuit. The inner grid and the anode are coupled together through the telephones or transformer, and both points are connected to the positive terminal of a l.p. battery. The theory of the circuit is that the electrons are attracted at very high velocity to the inner grid, and by virtue of their high speed pass through it and strike the anode.

The "Bijouphone" was on view; this consists of a variometer set vertically on end. On the top are aerial, earth, the 'phone terminals and a crystal detector.

Another radio receiving set exhibited was a single-valve regenerative set with a wave range of from 250 to 3,200 metres without the use of loading coils, tappings, or condensers. The tuning is effected by a special form of variometer in the aerial circuit. The stator of this is wound for 1,800 metres, and the main rotor for 1,775 metres. Inside the latter is another rotor wound for 50 metres, which is operated by a rod passing through the main rotor spindle. With the stator and rotor in parallel the variometer has a range of from 250 to 1,600 metres, and with the two in series the range is extended to over 3,000 metres.

Other inventions shown were "Sorbo" caps for telephones, consisting of sponge rubber between leather disks, or, in another arrangement, mounted on a metal ring to screw over the earpiece thread; an alarm clock arranged to switch on an electric lamp to illuminate the dial; an improved type of relay; a ball and socket electrical control giving five positions with a vernier adjustment; a combined respirator mouthpiece and telephone transmitter for employment by airmen while using oxygen at high altitudes; weatherproof insulators with separately moulded shrouds and deep grooves, &c.

Educational.—University of London.—A Goldsmid Engineering Entrance Scholarship of the value of £40 a year, tenable for three years, is offered for competition at University College, London, in September, and is available for students taking the full degree course in engineering, beginning in October. Full particulars of the scholarship examination can be obtained from the Secretary of University College, Gower Street, W.C.1, who will also supply information relating to degree and diploma courses in engineering which begin in October. The Engineering Laboratories at the College have recently been extended, and their equipment increased at a cost of about £54,000.

The Loth "Leader" Cable.—It has been decided to construct a submarine cable on the Loth system from Boulogne to the English coast, thus enabling vessels equipped with the necessary apparatus to guide themselves electrically, if necessary in case of fog, into port. It is hoped that the first section of the overhead cable between Paris and Boulogne, for the use of aeroplanes on the Paris-London route, may be ready for use next May. At Spithead, Portsmouth, and the Ambrose Channel of New York Harbour, Loth cables have already been installed.

Rapid Generating Plant Erection.—The State of California, which depends to a very great extent upon hydro-electric power, suffered severely from the water shortage which followed the mild winter of 1923. In addition to the curtailing of supplies to consumers, several steam stand-by stations were put into commission, and some of these were extended. In this connection the *Journal of Electricity* records an excellent piece of work by the Pacific Gas & Electric Co., aided by the (American) General Electric Co. Space existed in the former company's Sacramento station for a 5,000-kW steam turbo-generator, and drawings were also in hand for a condenser and auxiliaries for a 12,500-kW set in the company's Oakland station. It was found that the space available would just accommodate the larger set, and so orders were placed in February, and the General Electric Co. promised delivery of the turbo set by June 6th; as a matter of fact the set reached Sacramento by May 16th. The condenser, which was made by the C. H. Wheeler Co., was delivered three days ahead of the contract. In the meantime it was found necessary to alter the steam plant arrangements, designed for 5,000 kW, to accommodate the larger set. Four new smoke-stacks had to be erected, a new circulating water intake was installed, and alterations to the old circulating water system were made, involving the installation of over 300 ft. of 48-in. cast-iron pipes, and two large circulating pumps and fittings. Many difficulties were encountered, as, for instance, the finding of granite boulders during the dredging operations in the river bed. By June 15th the new machine was in service, and has since carried its full load satisfactorily. From the commencement to the completion the work occupied only just over four months. In 1920 a 12,500-h.p. set was installed in the company's Oakland station in eleven months or more, and this was considered a "rush job."

American Electric Vehicle Exports.—Only three electric vehicles, valued at $2,286, were exported from the United States during May last, as compared with 16 ($25,044) in the corresponding month of last year.

Telephonic Humour.—The telephone has taken a definite place with the two or three time-honoured subjects of quips in the stock-in-trade of the humorist. A number of good examples of the joke telephonic appear in "Le Téléphone à Stockholm," noticed in another column. An exasperated subscriber says: "I know that it is said that telephonists must work eight hours and sleep eight hours, but I have never heard that the two should be done at the same time."

Another jest from the same journal (*Kasper*) is the following:—"Who cries in the forest receives a reply," says the proverb, but, *nom d'un chien!* it is not the same with the telephone.

Proposed Tidal Power Development in Queensland.—Mr. A. A. Boyd, general manager of the Mount Morgan Gold Mining Co., Ltd., has recently pointed out to the Commonwealth Government that a problem of considerable interest to Eastern Central Queensland is that of utilising the tides for generating hydro-electric power. It is quite true, remarks Mr. Boyd, that the problem may appear to be of minor importance when the immense deposits of coal in Central Queensland are considered. The country does not, however, find itself at any advantage, either in respect of its coal or its rivers, over other parts of Australia, which have cheaper coal and less irregular watercourses. But if tides could be utilised the position would be very different, and Central Queensland would find itself specially favoured in possessing a coast along which tides of unusual range occur. Two tidal streams meet to the northward of Rockhampton, so that Central Queensland has the greatest tide range on the coast of Eastern Australia.

A 1,000-V Battery.—A 1,000-V battery was recently presented by the Chloride Electrical Storage Company to St. Bartholomew's Hospital, London, and installed in the Physicists' Laboratory. The installation consists of 42 batteries of 12 cells of the BK type, mounted on glass insulators, and connected to a switchboard designed by the company's engineering staff. Highly insulated overhead leads connect the battery to different parts of the laboratory. The main use of such a battery is to provide a steady potential for the calibration and use of the various instruments used in measurement of X-ray and radium dosage. Such instruments, *e.g.*, electroscopes, radium balances, iontoquantimeters, &c., depend almost invariably on the ionisation of a gas by the various radiations, the precise measurement of which is essential in modern technique. A reliable battery is indispensable for this purpose. Other purposes for which the battery is designed include its employment with thermionic valves for the amplification of heart and breathing sounds of hospital patients.

Electricity v. Gas.—Under the presidency of Mr. W. E. Young (Queenstown), the annual meeting of the Irish Association of Gas Managers took place on August 13th, at Dublin. In the course of his presidential address, Mr. Young said that gas concerns were more virile than ever. The governmental mind seemed to be obsessed with the idea that electricity was all that mattered. Undoubtedly, a cheap supply of electricity would be a benefit. Expert opinion, however, was divided on the merits of the Shannon scheme, and it might be that economies in generation would be more than counterbalanced by distribution costs over a sparsely-populated district. If so, local generating stations, where the demand existed, would appear to be the better way. In places where gas works were in operation, and where a sufficient demand for electricity existed, he suggested that the Government, by lending money at a low rate of interest, should help the gas companies to supply the need, as they had the best chance of making the scheme a success. He did not suggest that gas companies should be granted a monopoly, but he felt that some expert body should examine the likely prospects of a competing scheme of lighting. An expensive system of electricity would be no saviour of the country, and a reduced output of gas would increase the price thereof.

In the course of a paper on the position of the gas industry in Ireland, Mr. T. J. Reid (Ballina) deplored the fact that during the past decade about a dozen works had been closed as a direct result of the war, industrial strife, and unfair competition. Referring to electrical competition, he said that these schemes were not performing, and could not perform, the services of the gas concerns which they displaced. There was now a possibility of a much larger competitor than private or municipal installations, in a proposed national or State scheme of electricity. They had two young and inexperienced Governments in Ireland, both anxious to do their utmost to prove that they possessed the true governing spirit, and it was only natural that they should give ready ear to the suggestion that they should utilise the waters of the Shannon or the Bann.—*Irish Times.*

Fire at Halifax Electricity Works.—Later reports of the fire which occurred at the Halifax Corporation's power station on August 9th, briefly mentioned in our last issue, indicate that the outbreak was presumably due to a short-circuit in a cable subway. When the fire was extinguished it was found that the whole of the cables, over 60 in number, with the exception of five e.h.p. mains, were totally destroyed for a length of 40 yards. The main cables for a 10,000-kW, and a 6,000-kW turbo-generator were burned out, rendering the machines inoperative, but only the cables supplying the auxiliary gear of the 1,500-kW set were destroyed, while the main cables of a 3,500-kW set remained intact. The cables destroyed comprised 35 tramway feeders, 15 three-wire l.p. d.c. lighting cables, and 11 e.h.p. mains. By 1.45 p.m. on Sunday nine tramway feeders were restored to service, and the other six by midnight. Five of the d.c. feeders were replaced by 9 p.m. on Sunday, and the supply to the gasworks, a most important matter, was resumed before midnight. The work was continued on the two following days, and by the night of Tuesday, August 13th, the repairs were completed, with the exception of the main cables for the 10,000-kW set, which were promised by the makers for Saturday last, when it was hoped that the machine would be ready for service again by the following Monday. Credit is due to the chief engineer, Mr. W. M. Rogerson, and his staff for the rapid restoration of the supply in very difficult circumstances.

Aircraft Apprentices.—The Air Ministry announces that 500 vacancies for apprentices (between the ages of 15 and 16½) in the skilled trades of the Royal Air Force will be allotted to suitable candidates at examinations to be held on October 17th and November 4th. The latest date for the receipt of completed application forms, which may be obtained from the Secretary, Civil Service Commission, Burlington Gardens, W.1, is August 28th.

Appointments Vacant.—Turbine house attendant for the Greenwich Power Station of the L.C.C. Tramways. Shift engineer for the Crewe Corporation Electricity Department. Head of electrical engineering department (£400-£500), for the Coventry Technical Institute. Two assistant superintendents of machinery (700 Rs. per month), for the Commissioners of the Port of Calcutta. (See our advertisement pages to-day.)

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Mr. J. S. JONES, vice-president of Messrs. Chas. Cory and Son, Inc., electrical engineers, of New York, is on a visit to this country and the Continent. He will be glad to receive catalogues and descriptive matter relating to power and industrial equipment. This matter may be addressed, up to September 1st, c/o Old Colony Club, 7, Haymarket, S.W., or Old Colony Club, 3, Rue Auber, Paris.

Mr. WILLIAM PARKER, late of the English Electric Co., Ltd., has been appointed general manager of Bull Motors, Ltd., Stowmarket. Mr. H. C. WATERS, the late managing director, is not now connected with the latter company.

The marriage took place at Hawarden, on August 11th, of Mr. E. W. ASHBY, B.Sc., A.M.I.E.E. (Messrs. Sandycroft, Ltd.) to Miss DOROTHY BENNETT, of Hawarden. The staff of Messrs. Sandycroft's presented the bridegroom with a clock.

Mr. WILLIAM SAVILLE, general secretary of the British Columbia Electric Railway Co., Ltd., has been elected president of the Vancouver Electric Club. Mr. Saville was formerly with the Underground Electric Railway Co. of London, Ltd., and the Aire & Calder Navigation Co.

The wedding took place at Fleetwood Congregational Church, on Saturday, of Mr. GEORGE YEO, electrical engineer, and Miss BOYD. During the war the bridegroom served on board Lord Jellicoe's flagship *The Iron Duke*, and he was on the bridge at the Battle of Jutland.

Mr. ANDREW PATON HOLT, of Andrew Holt & Co., has joined the board of the Brazilian Traction, Light and Power Co., Ltd.

Obituary.—ALD. G. GILKES.—The death took place on August 13th of Alderman Gilbert Gilkes, aged 80, director of Gilbert Gilkes & Co., Ltd., turbine manufacturers, of Kendal.

New Companies Registered.

Invincible Manufacturing Co., Ltd. (199,784).—Private company. Registered August 7th. Capital, £500 in £1 shares. To carry on the business of manufacturers, exporters and importers of, agents for, and dealers in celluloid, celastoid, galalith, erinoid, xylonite, imitation ivory, mica, vulcanite, and any other allied products, &c. The subscribers (each with one ordinary share) are:—T. P. Jones, 9, Ferndale Road, Gillingham, Kent, accountant; and G. Rigden, 129, Richmond Road, Kingston-on-Thames, clerk. The first directors are not named. Qualification, 25 shares. Secretary: Miss J. Potter. Registered office: Standard Works, Station Road, Hounslow.

Scattergood & Johnson, Ltd. (199,809).—Private company. Registered August 8th. Capital, £10,000 in £1 shares (2,000 5 per cent. cumulative preference and 8,000 ordinary). To acquire the business now carried on at Cookridge Street, Leeds, as "Scattergood & Johnson," and to carry on the business of electrical engineers, suppliers of electricity, manufacturers of, and dealers in electric, magnetic, galvanic, and other apparatus and appliances, &c. The subscribers (each with one share) are:—B. P. Scattergood, "Bennets," Harpenden, Herts., engineer; J. M. Hargreaves, 35, Aberford Road, Woodlesford, near Leeds, engineer. B. P. Scattergood shall be permanent governing director so long as he holds half the issued ordinary shares. Qualification of directors, £250 shares or stock. Remuneration as fixed by the company. Registered office: 7, Cookridge Street, Leeds.

Electrical Contracting Co. (Tamworth), Ltd. (199,797).—Private company. Registered August 8th. Capital, £500 in £1 shares. To carry on the business of electrical engineers, electricians, mechanical engineers and manufacturers, workers, and dealers in electricity, &c. The first directors are:—P. Bennett, 30, George Street, Tamworth; J. E. Ford, Wigginton House, Tamworth; R. A. Kendrick, Tamhorn Park, Lichfield. Qualification, £1. Secretary: R. A. Kendrick. Solicitors: Dewes & Son, 10, Colehill, Tamworth, Staffs. Registered office: 30, George Street, Tamworth, Staffs.

Ace Battery Co., Ltd. (199,862).—Private company. Registered August 12th. Capital, £5,000 in £1 shares. To acquire from F. J. Brown, B.Sc. (Engineering), the business of a manufacturer of electric storage batteries carried on by him at Parsonage Croft, Bakewell, Derbyshire, as "F. J. Brown." The first directors are:—F. J. Brown, Parsonage Croft, Bakewell, Derbyshire; J. W. Upton, Bull's Head Hotel, Ashford, Bakewell; S. Slack, Derwent Farm, Froggate, Sheffield. The said F. J. Brown shall retain office as director so long as he holds 300 ordinary shares. Qualification, 100 shares. Solicitor: R. A. Watson, Lutterworth. Registered office: 6, Bank Street, Lutterworth, Leicestershire.

Century Electric Co., Ltd. (199,792).—Private company. Registered August 8th. Capital, £5,000 in £1 shares. To acquire the business carried on in Manchester by T. Armitage as the Century Electric Co., and to carry on the business of electricians, electrical engineers and contractors, dealers in wireless goods, &c. The first directors are:—T. Armitage, Belmont Street, Sale, Cheshire, electrician (governing and permanent director); Sarah Ashton, 165, Gorton Road, Redditch, near Stockport, cashier. Qualification, 1 share. Remuneration as fixed by the company. Secretary: Sarah Ashton. Registered office: 28, Brown Street, Manchester.

Electric Advertising Clocks, Ltd. (199,874).—Private company. Registered August 13th. Capital, £36,000 in 30,000 ordinary shares of £1 each and 120,000 deferred shares of 1s. each. To adopt an agreement with La Compagnie des Horloges Electriques Reclames, and to carry on the business of advertising contractors and agents, and manufacturers, importers and exporters of and dealers in advertising novelties, devices and apparatus of all kinds, &c. The first directors are:—J. A. Campbell, 73, Mount Nod Road, Streatham, S.W.16; E. F. Day, "Beechleigh," 45, Walthamstow Road, Walthamstow, Essex; J. F. G. Baer, 5, Turner's Close, Hampstead Garden Suburb, N.W.4. Qualification, 100 shares. Remuneration, £100 each per annum (chairman £200). Solicitor: R. J. Preston, 7, Bedford Row, W.C.1.

Official Returns of Electrical Companies.

Dictograph Telephones, Ltd.—Satisfaction in full on July 30th, 1924, of debentures dated July 10th, 1922, securing £15,000.

Abingdon Electric Supply Co., Ltd.—Satisfaction in full on July 1st, 1924, of debentures secured by trust deed dated December 31st, 1914, securing £1,950.

Hindhead and District Electric Light Co., Ltd.—Issue on August 7th, 1924, of £450 debentures, part of a series already registered.

Barrett & Morris, Ltd.—Debenture dated July 25th, 1924, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: B. Morris, 19, Gloucester Road, Finsbury Park, N.

Atkinson, Lloyd & Co., Ltd.—N. Wood, of 26, Corporation Street, Manchester, was appointed receiver or manager on August 1st under powers contained in debentures dated February 15th, 1924.

Cutting Brothers, Ltd.—C. J. Pain, of 18, Low Pavement, Nottingham, was appointed receiver and manager on August 11th, under powers contained in debentures dated March 6th, 1925.

Wellingborough Electric Supply Co., Ltd. (65,747).—Return dated March 1st, 1924. Capital, £50,000 in £10 shares. 3,700 shares taken up. £37,000 paid. Mortgages and charges, £17,500.

Union Cable Co., Ltd. (67,054).—Return dated May 29th, 1924. Capital, £100,000 in £1 shares. All shares taken up. £1 per share called up on 50,000 and 10s. per share on 50,000 shares. £75,000 paid. Mortgages and charges, nil.

Gent & Co., Ltd. (78,797).—Return dated April 1st, 1924. Capital, £50,000 in 20,000 preference and 30,000 ordinary shares of £1 each. 4,427 preference and 20,876 ordinary shares taken up. £6,887 paid on 987 preference and 5,930 ordinary shares. £18,416 considered as paid on the remainder. Mortgages and charges, £16,500.

City Notes.

Marconi's Wireless Telegraph Co., Ltd.

Senatore G. Marconi presided at the annual meeting on August 15th. In moving the adoption of the report, after referring in detail to the changes in the balance sheet (*vide* Elec. Rev., August 15th, p. 263), the chairman said that the trading profit showed little change from that of 1922, and but for the fact that they had serious losses of an exceptional nature to write off, the result of the year would have compared favourably with that of the preceding year. Looking forward and trying to make a reasonable estimate of the future development of the company's work, he thought that it was not too much to say that the prospects were brighter to-day than they had been at any previous period in the history of the company. In his speech last year he made some reference to the work which he had carried on with the assistance of Mr. Franklin and Mr. Mathieu in the development of a new system of radio communication, now popularly known as the "beam" system. He told them that he had succeeded in establishing communication between England and Cape Verde Islands, using only a fraction of the electrical energy hitherto found necessary to span such distances. Since that meeting their work had made a great advance. Not only had they been able to establish satisfactory communication with South America by the system, but for the first time in history the human voice speaking in England was easily and distinctly heard in Australia. By reason of its directional characteristics it increased the secrecy of wireless communication; it eliminated to a large extent the atmospheric disturbances which had always been the bugbear of the wireless engineer; in capital cost and in operating charges it was far more favourable than the old system of super stations working on long wave-lengths; and in addition it gave a rapidity of communication which the old h.p. station could never do. Using a power of about one-fortieth of that necessary for a super station, steady and reliable communication could be secured over great distances at a speed of several hundred words per minute. The speed of transmission was limited in practice only by the mechanical devices which it was necessary to employ, and those as at present constructed were capable of working up to two or three hundred words per minute. That, however, would not necessarily represent the limit of the capacity of a station constructed under the new system, since it was possible to transmit several messages simultaneously from the same aerial. The new system offered a prospect of reductions in telegraph rates far in excess of anything which had been previously contemplated, but which would nevertheless secure to the company a substantial margin of profit. Under the agreements which they had made through their associated companies with the Dominion Governments, and by the agreement which they had entered into with the General Post Office, provision was made for a reduction of at least one-third in the cable rates at present prevailing. The House of Commons had recently ratified an agreement between the Government and the company for the erection in this country of stations to work the beam system. The company would be erecting reciprocal stations in Canada, South Africa, Australia and India, on behalf of its associated companies which would operate them. That, however, they regarded as only the beginning of a great scheme of Empire radio communication. Their Canadian Company was proceeding immediately with the erection of a station in Montreal, to be followed promptly by another in Vancouver. The agreement had the characteristics which in his opinion a sound agreement should have; that was to say it satisfied both parties. He was also glad to be able to tell them that the basis of an agreement had been reached with the Post Office with regard to the payment by that Department for the company's war services. Having stated that the terms of reference for the arbitration which was to be held under the chairmanship of Lord Buckmaster with regard to the matters in dispute between the company and the three Government departments, representing the fighting forces, had been agreed upon, the chairman concluded by stating that they could look forward to the future of the company with much more hope than at any time during the past few years.—Mr. Godfrey Isaacs seconded the motion, which was adopted.

Enfield Cable Works, Ltd.

Viscount Grimston presided on August 15th at the annual meeting of this company, and in moving the adoption of the report (*vide* Elec. Rev., Aug. 8th, p. 226), said that the balance of net profit, after making the necessary adjustments, appeared to be £12,000 in excess of last year's figure. The indications last year were that their factory would be kept busy and they anticipated an increase in the turnover. The actual increase in turnover had been about 4 per cent. They had made a profit of £18,966 on the purchase of the London Foundry Company's assets. They had formed a subsidiary company to work the rolling mill which had been projected and that had enabled them to associate with themselves the firm of Messrs. Richard Johnson and Nephew. The directors looked forward to their investment in the subsidiary company becoming a profitable asset. Referring to the balance sheet, sundry debtors were up £43,000 on the previous year, but that was due entirely to the increase in the turnover. The stock in trade, £127,000, was taken on the usual conservative basis and he looked upon that figure as almost equivalent to cash. Land, buildings and plant figured at £227,000; a valuer's estimate put the real value at £5,000 or £6,000 above the amount at which it stood in the books. The company's turnover in Australia last year was something like £100,000 and therefore they had sent out one of their best men and they had formed a small subsidiary company for him to operate in Australia. Assuming that they did not suffer from labour troubles, they anticipated a turnover at least equal to that of last year, and, moreover, they would feel the full benefit of the new buildings and plant that they had put up. Last autumn three of the old directors retired and Sir George Sutton, Bt., Sir T. O. Callender, Mr. D. Sinclair, Mr. F. Hird and Mr. A. E. Tanner were appointed to the board, which had put the company on an entirely new plane. The company was now entitled to brand its cables "C.M.A." Sir G. Sutton seconded the motion and it was carried.

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Chili Telephone Co.—19,800 shares of £5 each, fully paid, Nos. 99,001 to 118,800.

Oriental Telephone and Electric Co.—150 new ordinary shares of £1 each, fully paid, Nos. 428,842 to 428,991; and 150 new 7 per cent. cumulative preference shares of £1 each, fully paid, Nos. 188,642 to 188,791.

The undermentioned securities have been ordered to be officially quoted:—

Chili Telephone Co.—19,800 shares of £5 each, fully paid, Nos. 99,001 to 118,800.

Pennsylvania Water and Power Co.—$1,000,000 5½ per cent. first refunding gold bonds, series "A," Nos. 2,001 to 3,000.

South Wales Power Co.—£600,000 6 per cent. first mortgage debenture stock.

Southland (County of) Electric Power Board (Guaranteed by New Zealand Government).—£750,000 5 per cent. debentures, Nos. 1 to 7,500 (£100) (Bearer).

Companies to be Struck off the Register.—The names of the undermentioned companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—

Kelvin-Hardy Electric Co., Ltd.
Quain Electric Co., Ltd.
Radiola Wireless Telephone Parts Co., Ltd.
Thurlow Wholesale Electric Supplies, Ltd.
Vickers-Australia, Ltd.
Vickers-China, Ltd.
Vickers-Hellenic, Ltd.
Vickers-Orient Co., Ltd.
Yorkshire Battery and Manufacturing Co., Ltd.

East African Power and Lighting Co., Ltd.—The accounts for 1923 show a profit, after providing for debenture interest, of 165,167 shillings; the balance available, with 29,066 shillings brought forward, is 194,233 shillings. Final dividend 2½ per cent., making 5 per cent.; 60,000 shillings to depreciation reserve account; 32,983 shillings forward.—*Financial News.*

Swiss Company.—The Société de l'Industrie Electrique et Chimique of Geneva (the former Usines Electro-chimiques de Hafslund) reports net profits of 343,000 fr. for 1923-24, the sum available, including the amount brought forward, being 1,394,000 fr. It is proposed to pay a dividend at the rate of 10 per cent., as in the previous year.

French Company.—The Compagnie de Signaux et d'Entreprises Electriques reports that the company completed three important signalling systems in 1923, and also carried out works of smaller extent on the various railways. The maintenance and sales departments followed a normal course, and the signalling apparatus shops were operated at full output, while the cable departments were working at full efficiency with satisfactory results. During the year the company secured an interest in an Italian works, as it is necessary to manufacture in that country in order to introduce the signalling systems on the railways there. The net profits of 3,160,000 fr. have permitted of the payment of a dividend at the rate of 15 fr. per share.

Italian Edison Company.—The Milan correspondent of the *Financial Times* reports that the shareholders of the Edison Electrical Co. have approved the increasing of the company's capital from 180 million lire to 450 million lire. The increase will be effected by the issue of deferred shares which will rank *pari passu* with the original share capital after the latter has received 6 per cent. Of the new capital, 27 million lire will be reserved for subscription by the Compagnie Continentale Edison, of Paris, and the balance is to be offered proportionately to the present shareholders.

Brazilian Traction, Light and Power Co., Ltd.—The annual meeting was held in Toronto on August 14th. Mr. E. R. Wood, who presided, considered the results of the year's working as satisfactory in view of the depreciated exchange. He said that the damage done to the company's Sao Paulo properties during the recent revolutionary disturbances was comparatively slight. The loss of revenue was, however, more serious, and probably amounted to $500,000 for the month of July, with a similar loss for the remainder of the year.

Tyneside Tramways and Tramroads Co.—At the half-yearly meeting of this company on August 12th, Mr. G. E. Henderson, the chairman, said that the directors regretted that again they were unable to recommend the payment of a dividend on the ordinary shares. During the six months under review the trade on Tyneside had continued in a very depressed condition. There were only very slight signs of improvement, and whether these would continue was doubtful. The company's report was abstracted in our last issue.

Clyde Valley Electrical Power Co.—The directors have decided to pay an interim dividend of 3 per cent. actual on the ordinary shares for the half-year to June 30th (less income tax).

Fairbairn Lawson Combe Barbour, Ltd.—In view of the depression affecting the industry no interim distribution is to be made on the ordinary shares; the interim preference dividend is being paid.

Lancashire Dynamo and Motor Co., Ltd.—Interim dividend of 2½ per cent. actual on preference shares. No distribution is made on the ordinary shares.

Davis & Timmins, Ltd.—Interim dividend on ordinary shares at the rate of 6 per cent., less tax, for the half-year to June 30th.

County of London Electric Supply Co., Ltd.—The issue of £1,500,000 5½ per cent. one-year notes was over-subscribed by the existing stock and share holders.

Radio Corporation of America.—Quarterly dividend of 1¼ per cent., payable October 1st, on the preferred stock.

Torquay Tramways Co., Ltd.—The directors have declared an interim dividend of 4 per cent., free of tax.

Stocks and Shares.

MONDAY EVENING.

THE principal element in Stock Exchange markets this week is, of course, the signature of the Peace pact, which, according to expectations, should have the effect of settling the protracted chaos that has upset world conditions since the end of the war. In the first place, money stocks are all harder, some reflection of which is found in the prices of fixed-interest securities quoted in our lists. Money has become easier, in consequence of the way in which the New York exchange has been moving in favour of this country, due indirectly to the peace considerations which have removed into the background the fear of a rise in the Bank Rate. With trade conditions more cheerful, it is ardently hoped that iron, steel and similar companies will recover their lost ground in Continental markets. Therefore, the balance of trend this week lies in favour of security holders, and a feature is the way in which cable manufacturing shares have further advanced.

British Insulated changed hands as high as 59s., Callenders and Henleys followed closely upon their heels. The rises served to bring in shares which have hitherto refused to be tempted-out, and prices are a little below the best, though showing very substantial improvements on the week. Henleys have gained 2s. 3d., Callenders 2s. 9d., and British Insulated 3s. 6d. British Aluminiums are 3s. up. Telegraph Constructions have not moved. The market has been very bare of stock, but, as just mentioned, some of the holders were not proof against the opportunity offered by the mild boomlet, and their sales usefully provided a certain amount of supply to meet the demand. It is now considered practically certain that dividends will be increased at the end of the companies' financial year.

Cable stocks are better in tone, and Easterns are 3 up, though the others show no quotable change. Globe ordinary have yielded ½, upon the consideration that the shares pay less than the others in the group. Marconis spurted at one time to 35s. 6d., but the price reacted to 33s. 9d., which leaves the shares 1/16 higher on the week. The rise is due to the speech of the chairman at last week's meeting, which also had the effect of putting up Canadian Marconis to 7s. 6d. before profit-takers came in and lowered the price to 7s. United River Plate Telephones are better and Chile Telephones at 5⅛ show a small rise.

The fear of an extensive strike amongst the electrical supply companies' employés has led to a little dulness in the quotations for the companies' shares. City Lights went back to 2⅛, but County of London remained at 2¾. The County company has now issued its One-year 5½ per cent. Notes at 99¾, and mild curiosity is expressed in regard to the probable outcome of the offer. The Notes will not appeal to everybody, having regard to the shortness of their life. St. James's fell 5s. Westminsters are quoted at 10 x.d. and Charing Cross at 2 are also ex, the yields on these last-named being now 7½ per cent. and 7½ per cent. respectively, on the basis of the 1923 dividends.

Notwithstanding the recent deluge of new issues, the stream of which has been fortunately stayed for a time, owing to monetary, political and holiday influences, a steady demand continues for sound securities. It is true that there is more supply available now than was the case six months ago, and the greater scope for selection which obtains may be illustrated by a brief selection of preference shares actually on offer in the market at the moment. Keeping to those shares which are not included in our regular tables, the following list gives a useful idea of shares obtainable:—

Cumulative preference.	Rate. %	Payable.	Price.	Yield. £ s. d.
Clyde Valley Elec. 2nd £10	6	J. & D.	14⅛	5 13 6
Egham & Staines Elec.	7½	J. & J.	21/9	6 17 6
Electric Supply Corp.	6	J. & J.	20/6	5 17 6
Fife Tramways Light & Power ...	6	F. & A.	21/3	5 13 0
Lancashire Elec. Light	6 (a)	J. & D.	26/-	4 12 6 (a)
Llanelly & District Elec.	6	F. & A.	19/6	6 3 0
Midland Counties New	6	M. & S.	20/6	5 17 0
Shropshire, Worcestershire & Staffs. ...	6	M. & S.	20/9	5 15 6
South Wales Power 5s. paid	6¼	J. & J.	par	6 10 0
Yorks. (W.R.) Elec. Trams	6	J. & J.	18/6	6 9 6
Yorkshire Elec. Power	6	F. & A.	22/-	5 4 6

(a) Tax free.

The Egham and Staines issue calls for £5,625 per annum for its dividend and the amount available from last year's profit was £7,700. The Clyde Valley's second preference take £40,000 a year, which is covered 4½ times by the profits for 1923. The Lancashire Electric preference dividend is covered 3½ times over, Llanelly nearly twice, the Shropshire and Worcestershire 8¼ times and the Yorkshire preference more than 2¼ times.

Amongst traction stocks, Anglo-Argentines are the main feature of strength, the first and second preferences having risen 5s. each, on the assumption that the outlook is brighter and that the way is clear for the long-protracted dispute, between the company and the municipal authorities, to be amicably arranged. The 5 per cent. debenture stock remains at 73½. Mexicans are heavy. The Light & Power Company's First Bonds at 59½ and Mexico Tramway Sixes at 45¼ are both a point lower. Brazilian Tractions are heavy. The loss of revenue due to the recent revolution may reach a million dollars. The London group fails to make headway, prices remaining weak.

Central London Assented ordinary gained a couple of points, while the Underground Electric Railways stocks keep steady. The last-named company's £10 shares went up to 2⅞ before reverting to 2¾. Buying was encouraged by the fall in the dollar as against the pound sterling, because the interest on the Income bonds is payable in dollars as well as in pounds, and, when the rate swings against this country, it adds considerably to the amount which the company has to provide for the service of the issue. Another offer is said to have been made to the East London for the purchase of its undertaking. The proposed terms offer rather better prices than prevail in the market for the existing stocks, the buyer being the Southern Railway.

Babcock & Wilcox have strengthened to 48s. 9d. Other engineering shares are good and the iron and steel list exhibits a number of minor improvements, upon hopes of trade revival. Rubber shares are a shade better, the price of the produce responding to the latest cut made in the proportion of output. Business in many of the Stock Exchange markets is not bad considering the season of the year.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1923.	Price Aug. 18, 1924.	Rise or fall.	Yield. p.c.
Brompton Ordinary	1	12	10	37/-	—	*£5 8 1
Charing Cross Ordinary	1	14	14½	2xd	—	7 5 0
do. do. do. 4½ Pref.	1	4½	4½	17/6xd	+6d.	5 2 10
Chelsea	1	10	12	37/6	—	6 8 0
City of London	1	15	15	2 5/16	+ 1/16	6 9 10
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
County of London	1	10	15	2 3/8	—	6 6 4
do. do. 6 % Pref. ...	1	6	6	1 1/8	—	5 6 8
Edmundson's Ordinary	8	7	7	5	+ ½	4 5 4
do. 6 % Pref.	5	6	6	5 3/8	—	5 11 7
Kensington Ordinary	5	12	14	9 1/2xd	— ½	7 9 4
London Electric	1	10	10	31/-	—	6 9 0
do. do. 6 % Pref. ...	5	6	6	5 3/8	—	5 11 7
Metropolitan	1	8½	10	1 5/8xd	×6d.	6 1 3
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary ...	1	2½	6	18/9	—	6 8 1
do. 5 % Pref. ...	1	5	5	17/-	—	5 17 8
do. 7 % Pref. ...	1	7	7	25/-	—6d.	5 12 0
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	1 1	—	5 6 8
Urban Ordinary	1	—	4	18/3	—	4 7 8
do 6 % Pref. ...	1	5	6	1	—	6 0 0
St. James' and Pall Mall ...	5	14½	17½	12 3/4	— ¼	6 16 0
South London	1	11	15	43/3	—	6 18 7
South Metropolitan Pref. ...		7	7	1 1/2	—	5 12 0
Westminster Ordinary	5	12	15	10xd	—	7 10 0
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	19/6	—	7 13 10

HOME RAILS.

Central London Ord. Assented	Stock	4	4	70½	+2	5 13 6
Metropolitan	,,	3½	4	8 xd	—	5 0 0
do. District	,,	3	3½	50½	—	6 18 7
Underground Electric Ordinary	10	Nil	Nil	2 1/2		Nil
do. do. "A" ...	1	Nil	Nil	8/-	—	Nil
do. do. Income	Bonds	5	6	99	—	*6 1 5

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	103½	+ ½	5 16 0
do. Def.	,,	1½	1½	23½	—	6 6 4
Chile Telephone	5	6	6	5 5/16	+ 1/16	5 8 0
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension...	10	10	10	16½	—	6 3 0
Eastern Tel. Ord.	Stock	10	10	161½	+3	6 1 7
Globe Tel. and T. Ord.	10	10	10	17 1/2	— ½	5 15 3
do. do. Pref.	10	6	6	11½	—	5 6 10
Great Northern Tel.	10	24	22	27½	—	7 18 6
Indo-European	25	7	7	23½	—	*5 6 1
Marconi	1	15	10	1 1/2	+ 1/16	5 18 6
Oriental Telephone Ord.... ...	1	12	12	1 3/4	—	*6 3 0
United R. Plate Tel.	5	8	8	6 1/2	+ 1/16	*5 15 6
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	16½	—	6 4 1

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	12½	5½	5 1/2	+ ½	8 12 6
do. do. 2nd Pref. ...	5	5½	6	3 1/16	+ ½	9 16 0
do. do. 5% Deb. ...	Stock	5	5	73½	—	6 16 0
British Electric Traction Ord. ...	,,	5	6	91½	—	6 11 2
do. do. 6% Pref.	,,	6	6	101½	—	5 18 3
Brazil Traction	100	4	4	52	— ½	7 13 0
Brit. Columbia Elec. Ry. Pcs.	Stock	5	5	87½	—	5 14 3
do. do. Preferred	,,	5	90/-	82½	—	*5 5 8
do. do. Deferred	,,	8	127/-	103½	—	*8 5 0
do. do. Deb.	,,	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5 % Pref. ...	1	5	2½	5/6	—	9 1 10
London United Tram. Deb. ...	Stock	4	4	45½	—	8 15 10
Mexico Trams. 5% Bonds ...	—	Nil	5	6 4	—	7 11 6
do 6% Bonds ...	—	Nil	Nil	44½	—1	Nil
Mexican Light Common ...	100	Nil	Nil	16	—	Nil
do. Pref.	100	Nil	Nil	41	—1	Nil
do. 1st Bonds ...	—	5	5	5 1/2	—1	8 8 0

MANUFACTURING COMPANIES.

Babcock & Wilcox...	1	20	12	48/9	+9d.	*1 19 4
British Aluminium Ord....	1	5	5	2 8/9	+3/-	3 15 3
British Insulated Ord.	1	15	15	58/-	+2/6	5 3 5
Callenders	1	15	15	57/-	+2/9	5 5 4
do. 6½ Pref....	1	6½	6½	2 3/8	—	5 11 10
Crompton Ord.	1	5	Nil	1/8	—	8 17 10
Edison-Swan	4/-	7½	—	5/-	—	6 0 0
do. ,, 5% Deb.	Stock	5	5	73½	—1	6 15 6
Electric Construction	1	10	10	1 3/8	—	6 19 0
English Electric	1	6	5	15/3	—	6 1 2
do. do. Pref.	1	6	6	19/6	—	6 3 1
Gen. Elec. Pref.	1	6½	6½	2 2/-	—	5 13 1
do. Ord.	1	5	5	18/-	+9d.	5 12 0
Henley	1	15	15	58/-	+2/3	5 3 5
do. 4½ Pref.	5	4½	4½	4 2	—	5 6 0
India-Rubber	1	10	5	1 1/2	—	*7 5 6
Met.-Vickers Pref....	2	8	8	2 2	—	8 14 9
Siemens Ord.	1	5	—	1	—	5 0 0
Telegraph Con.	12	80	80	84½	—	*4 17 7

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c.		Price Aug. 19.	Fortnight's Inc. or dec.
a Acid, Oxalic	per lb.	5¾d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£52	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£25	...
a Copper Sulphate	,,	£25 10s.	...
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a ,, Perchlorate	,,	4½d.	...
a Shellac	per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ...	,,	£7 15s.	...
a ,, Roll	,,	£7 15s.	...
a Soda, Chlorate	per lb.	3d.	...
a ,, Crystals	per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ...	per lb.	4½d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£125 to £130	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet	,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£231	£2 inc.
Grade II	,, ,,	£164	...
Grade III	,, ,,	£ 0	...
c Brass (rolled metal 2' to 12' basis)	per lb.	9½d.	...
c ,, Tubes (solid drawn) ...	,,	1/- to 1/0½	...
c ,, Wire, basis	,,	10½d.	...
c Copper Tubes (solid drawn) ...	,,	1/1½	...
c ,, Bars (best selected) ...	per ton	£94	...
c ,, Sheet	,,	£. 4	...
c ,, Rod	,,	£94	...
d ,, (Electrolytic) Bars ...	,,	£68 15s.	25s. inc.
d ,, ,, Sheets ...	,,	£144 10s.	...
d ,, ,, Wire Rods ...	,,	£78 15s.	25s. inc.
d ,, ,, H.C. Wire	per lb.	9½d.	½d. inc.
f Ebonite Rod	,,	2/- to 3/6	...
f ,, Sheet	,,	2/- to 3/6	...
n German Silver Wire	,,	2/3	...
h Gutta-percha, fine	,,	7/6	...
h India-rubber, Para fine	,,	1/1	½d. inc.
Iron Pig (Cleveland Warrants) ...	per ton.	£5 2s. to £5 2s. 6d.	...
f ,, Wire, galv. No. 8, P.O. qual.	,,	£15	...
g Lead, English Pig	,,	£34 5s.	5s. inc.
g Mercury	per bot.	£18 to £13 5s.	5s. inc.
e Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e ,, ,, medium	,,	4/- to 8/-	...
e ,, ,, large ...	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/0½	...
p ,, ,, drawn bars & rods	,,	1/8	...
p ,, ,, rolled strip & sheet	,,	1/3½	...
p ,, ,, wire	,,	1/8½	½d. inc.
o Platinum	per oz.	£36	...
d Silicium Bronze Wire	per lb.	1/0½	...
r Steel, Magnet, in bars	,,	8d.	...
n Tin, Block (English)	per ton.	£257 to £257 10s.	20s. dec.
n ,, Wire, Nos. 1 to 16	per lb.	3/11	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

An Electrical Strain Recorder.—The recording of strains produced in bridges by trains or motor vehicles passing over them has been made possible by a new electric telemeter or strain gauge developed at the U.S. Bureau of Standards. A heavy motor-lorry running over a rough floor or a locomotive going at high speed may cause a strain on a bridge truss which is very much greater than would have been caused by the same machine when not in motion. Similar problems occur in the case of aircraft, and the new gauge can also be used to measure the strains produced in them while in flight. In the tests of the Shenandoah 60 such gauges were used, and the data secured by their aid are expected to prove of great value in the future design of airships. The gauge has also proved of value in the laboratory testing of structural materials when numerous strain measurements have to be made. The gauge has two points that are clamped to the bridge truss at the point where the measurements are to be made and two resisters composed of carbon disks. Any change in the load on the truss causes a change in the distance between these points, and this variation in turn produces a change in the pressure on the stacks of carbon disks and consequently in their electrical resistance. The gauge operates on the principle of a Wheatstone bridge, the resisters forming two arms of the bridge, and the electrical apparatus for measuring and recording these changes can be placed at any convenient point. It is possible not only to record very rapid changes, but also to use several gauges at once. As many as 12 gauges have been so used with a single recorder. —*Times Trade and Engineering Supplement.*

The World Power Conference at the British Empire Exhibition.

(*Continued from p. 242.*)

Electrometallurgy.

In Hall II during the afternoon of July 9th there was quite a good discussion; and Mr. John Murphy, of the Department of Railways and Canals, Canada, made an admirable chairman. The first paper dealt with electrolytic iron, which is now being used commercially for tubes, sheets, &c. The author, Mr. T. W. S. Hutchins, pointed out that the progress made during the past five years in electrolytic iron had been much greater than it was during the first five years of the iron and steel industry itself. One of the principal processes was that worked by La Société Anonyme Le Fer in France, which was said to have got over certain troubles which it originally encountered. It was pointed out by Mr. Matthewson, who read the next paper on "Power in Electrometallurgy in the United States" that certain interests in America had joined forces with the Le Fer company and intended to erect a factory at Niagara for the manufacture of electrolytic iron. The Western Electric Co. of America already has a small plant which turns out some 3,000 lb. of this material per day for use in electrical instruments.

Reverting to Mr. Matthewson's own paper, the author called attention to the fact that comment had been made regarding the smaller amount of power used in the United States for aluminium than for steel. The fact was, he explained, that steel was making greater progress at the moment than aluminium. The figures in the paper were 450,000 h.p. for electric steel refining and 350,000 h.p. for aluminium. During the war a large number of electric steel plants were installed, and these had now been distributed more widely over America and were being largely used. Commenting on electrolytic iron, during the introduction of his paper, he laid stress upon the much higher qualities of this compared with ordinary iron and steel, and said that it had been pointed out that there were some uses for this material, which more or less ignored the question of price. That, in itself, was sufficient inducement for those who had succeeded in reaching such an advanced stage in the processes now being operated on a commercial scale.

Although several papers were read during the afternoon dealing with various other subjects associated with electrometallurgy, electrolytic iron cropped up from time to time. Thus it was that Major H. Johansen (Norway) later on gave some information with regard to a Norwegian company which had been working for seven or eight years to find a new method for reducing iron ore by gas and, to a larger extent, by electricity. It had been intended to prepare a paper on the subject, but the experimental work was not completed in time. The main point of this process is to regenerate the reducing gas in an electric flame furnace. The two gases are reduced to CO by the action of the electric flame, thus effecting a large economy, so it is claimed, in the expensive gases. A piece of iron sponge so obtained was exhibited at the meeting, and at present about 2,000 kg. per day is being produced. It is the intention, however, to build in the near future a plant which will produce about 12,000 tons a year. If this product is smelted in an electric furnace, the result is a pig iron which resembles electrolytic iron in that it contains 99.95 per cent. iron. The experimental work has been carried out in the "Norsk Staal" plant at Trondhjem (Norway), and a report upon the recent experimental work, by Prof. Goerens and Drs. Kruach and Lappe, was read.

Coming back to the paper by Mr. Matthewson, dealing with power in electrometallurgy in the United States, the chairman gave a list of the many industries situated at the large waterfalls in Canada, and said that the various electrochemical plants had a value of $33,000,000, whilst the total annual gross revenue was $27,000,000, or about 80 per cent. of the capital value. There were 5,000 men employed.

The other papers read were: "Electrometallurgy in Italy," by Dr. F. Giolitti, and "Electrical Engineering as a Leading Factor in the Development of Modern Steel Works," by W. Geyer, upon neither of which were any comments made.

Railway Electrification Progress.

Mr. Roger T. Smith, past president of the Institution of Electrical Engineers, presided at the session devoted to the subject of "Power for Rail Transport," held in Hall I on the afternoon on Wednesday, July 9th, and in opening the proceedings gave an excellent summary of the seventeen papers under review and which, in addition to railway electrification, dealt with such widely diverse subjects as Power Saving Through Anti-Friction Bearings and Some Notes on the Frequency Converter, the latter by Prof. Dr. Paul Müller (Germany). Pressure on our space permits only a reference to the purely electrical papers, and that but very briefly. Dr. Ing. A. Hruschka (Vienna) reported that, owing to the loss of its coal mines as a result of the war, a big programme of railway electrification had been embarked upon in Austria. Work was already in hand on about 400 miles of line, energy for which would be supplied from hydro-electric stations, the Reutz, near Innsbruck, of 16,000-h.p. capacity, being already completed. Fifty-three of the 220 electric locomotives—replacing 280 steam locomotives—have been ordered. They comprise six types, four being equipped with single-phase compensated series motors and two with 2- and 4-phase induction (phase converting) motors. The main transmission lines will work at voltages of 50,000 to 110,000, and the contact lines at an average of 15,000 volts, single-phase current, a frequency of $16\frac{2}{3}$ cycles being used. It may be mentioned that the electrification work is linked up with the employment problem, all the plant being of Austrian construction.

Electrification in the Dutch East Indies.

Dr. G. de Gelder, the chief engineer of the Electrical Department of the D.E.I. State Railways, in a paper on the electrification of the railways in the Dutch East Indies, reported that, owing to Parliamentary opposition, the scheme for converting the main lines in Java had been cut down to embrace only the lines in the Batavia area. Water power is being utilised to supply three-phase current at 70,000 volts, which will be employed both for lighting and railway traction purposes, the former as 200-V, three-phase current, and the latter at 6,000-V, three-phase transformed down to 1,500 V, d.c. by means of rotary transformers or motor generators.

Electric Railways in Great Britain.

Mr. Roger T. Smith, in a lengthy paper on Electric Railways in Great Britain, pointed out that in many countries the need for electrification was mainly the national question either of conserving their limited coal resources or, where they were reliant upon imported fuel, of utilising their water-power resources. In Great Britain, where coal was abundant and relatively cheap, main-line electrification was purely a question of transport economy, with the result that the steam locomotive still held the field so far as the cost of power was concerned. On the other hand, although there was no question that electric traction could produce traffic savings, particularly in goods and mineral train working, traffic officers had not yet convinced themselves of this. Urban and suburban lines had been electrified not primarily be-

cause it saved money, but because conditions had arisen with which steam traction could not cope. In Great Britain at the present time there was 924½ miles of electrified lines (single track) in service, of which 856 miles was urban or suburban, 48½ miles main-line mineral, and 19 miles experimental. The paper contained very complete details of the various electric railways in this country, the aggregate ton-mileage worked electrically last year being 4,781,500,000 and the energy consumption 486,000,000 kWh.

Continental Developments.

Prof. I. Franco, of the Netherlands State Railways, in a paper which dealt with all classes of railway engine—steam, petrol, petrol-electric, and electric—mentioned that electric traction in Holland was likely to be confined to lines on which the traffic justified the expenditure. There were only two lines in operation in the country, one of 20 miles between Rotterdam and Scheveningen, using 10,000 V, single-phase, a.c., stepped down by a transformer on the motor coach to 300 volts, and one between Leyden Katwijk and Noordwijk, on which 1,000 V, d.c. was employed. Work is, however, in hand on the electrification of the main line between Rotterdam and Amsterdam, a distance of about 56 miles. Current at 6,000 or 10,000 volts will be converted to 1,500 V, d.c., at sub-stations.

Prof. F. Tajani, in his paper, mentioned that the first electric railway to begin a regular service in Europe was opened between Florence and Fiesole in 1890. The subject of three-phase *v.* direct current for railway traction was dealt with at great length, the author pointing out that while opinion was still divided as regards the choice for heavy-traffic railways, for suburban and secondary lines everything was in favour of the d.c. system.

The dependence on imported coal had, stated Mr. H. J. Schreiner, the chief electrical engineer of the Norwegian State Railways, led the Government to study the joint question of water-power utilisation and railway electrification. Three sections of the State system had already been electrified, and work on two others was in hand, the system adopted being single phase at about 15 cycles, and approximately 15,000 volts, stepped down from a generation pressure of 60,000 volts. Mr. Schreiner also dealt at length with the work which had had to be done in connection with the State telephone and telegraph lines in order to prevent any interference with their working by the electrified railways.

Mr. I. Ofverholm, in his paper, reported that the principal electrified railway in Sweden was the Svaxton-Riksgransen line, about 272 miles in length and mainly used for the transport of iron ore. With the extension to Narvik it was claimed to be the longest electric railway in Europe, the total length being 278 miles. Power is supplied from the Porjus hydro-electric station at 4,000-V generation pressure, stepped up to 80,000 V for transmission and reduced to 16,000 V, single-phase, 15-cycle current for the contact wire. Of the privately-owned railways, six lines had been electrified, while the State railway authorities were now converting the Stockholm-Gothenburg line, 286 miles, from steam to electric traction, single-phase current, at a frequency of 16⅔ and 16,000 volts for the trolley line, having been decided upon. The system adopted of an insulated return cable connected at short intervals to the rails rendered bonding of the latter unnecessary, and enabled work on the track to be undertaken without danger to the repair men.

German Railway Electrification.

Herr Wilhelm Wechmann, of the German Ministry of Transport and Railways, dealt with the subject of main-line electric railways in Germany, of which 375 miles is in operation, all of it working on single phase, a.c., with a frequency of 16⅔ periods per second, and a line pressure in the trolley wire of 15,000 volts. A standard design of trolley wire was now used throughout, and the number of locomotives reduced to a few types. Herr Wechmann remarked that electrical operation was economically superior to steam, the saving being sufficient to pay from 6.6 to 13.8 per cent. interest on the capital expenditure for the electric locomotives and equipment of the lines.

Financial Aspects of Main-line Electrification.

Sir Philip Dawson, M.P., drew attention to the fact that, despite the progress made in other parts of the world, Great Britain had nothing to show in the way of main-line railway electrification. But for the recent grouping of British railways, the electrification of the system between London, Brighton, and Worthing would by now have been in hand. It was, however, bound to come, and would bring with it abundant and cheap supplies of electricity not only in industrial districts, but also in rural areas. Electrification would in many cases release valuable land at present used in connection with steam railway operation, the value of which for building purposes would largely cover the capital required for the carrying through of the electrification. Prior to the railway grouping, he had worked out a scheme for the old Brighton Co.'s system, which included 502 miles of single track and 272 miles of sidings. The total cost worked out at £10,808,000, of which £3,100,000 was for transmission, distribution, sub-stations, and allied work; £3,000,000 for electric locomotives and rolling stock; £1,500,000 for repair shops, tools, &c., and £15,000,000 for permanent-way additions and improvements, &c., plus £1,500,000 for contingencies and interest. Even with such an outlay, an increase of 70 per cent. in suburban and 35 per cent. in main-line traffic would show a return of over 8 per cent. on the total capital required.

Col. O'Brien, in commenting on Sir Philip Dawson's paper, questioned the accuracy of the estimates. In his view only the £31,000,000 for the first item was a new capital charge, all the remainder being practically renewal work, and consequently chargeable to revenue. There were also two important problems to be solved in connection with railway electrification, *viz.* (1) that of the one-man operation of main-line trains, and (2) the heavy cost of siding electrification, owing to the considerable length of sidings, which in this country was approximately one mile to each two or three miles of running track.

Mr. W. S. Murray (New York) related his experience in connection with the electrification of the New Haven (Conn.) railway, which was completed in 1917. He had come to the opinion that d.c. working was the best. Although the question of railway electrification was coming to the front in America, no great advance would be achieved until there was more standardisation in the systems adopted by different railways. One of the great advantages of the steam locomotive was that it could be used on any standard-gauge line, and when this remark became true of electric locomotives progress would be rapid and capital for railway electrification more readily forthcoming.

Hungary's New Main-line Electrification System.

M. L. de Verebely, electrical consulting engineer to the Hungarian State Railways, described the new system of main-line electrification which was being adopted in Hungary and which had been worked out by M. de Kando, of the Ganz Co., of Budapest. The object in view was that of rendering separate power plants and transmission systems for exclusively railway purposes superfluous and drawing the necessary supply from any general standard power system with the least transformation and without the use of rotating machinery in sub-stations. M. de Kando's method, while using high-pressure, three-phase current, embraced the replacement of induction traction motors by motors in which the voltage was varied according to the load and according to a definite law in such a way that with the lower pressure applied at light load the magnetising current and the iron losses became smaller, and hence the power factor and efficiency was increased. On the other hand, the higher pressure applied at full load strengthened the magnetic field and gave a larger pull-out torque, the fundamental law being that the motor would run throughout the whole range of its capacity with maximum con-

stant efficiency if the pressure was varied proportionately to the square root of the input or output. This variation of pressure was obtained by means of a motor generator on the locomotive working as a phase converter, taking 50-cycle, single-phase current and delivering three-phase current. Since October last the system had been under practical trial on 25 miles of the State railway system between Budapest and Alag, and although the author stated that the time had not yet come to give full details, all the principal parts of the new system were working to entire satisfaction. The locomotives which had been constructed had five driving axles, and were of 2,700 h.p., or 34 h.p. per metric ton of weight.

Railway Electrification in the Far East.

Mr. J. Leggatt gave some interesting details of the electrification work which was in hand in India, where the first line would be running by January next. The line had a gauge of 5 ft. 6 in., full advantage of which was being taken by building the coaches 12 ft. wide. Power would be taken from the Tata 100,000-V hydro-electric station and used as 1,500 V, d.c., rotary transformers being employed. In addition to the work in hand on the Great Indian Peninsula Railway, the Bombay-Baroda was also beginning electrification, while several schemes in the Calcutta district were under consideration. In the Western Ghats some of the problems to be solved could be gauged from the fact that the severe gradients involved the use of as many as five steam locomotives. In view of what was being done in Australia, New Zealand, South Africa, Japan, and Canada, he was disappointed with the position in Great Britain, and considered that British railway authorities ought to hesitate no longer in deciding to electrify the main lines.

Power for Rail Transport.

The morning session in Hall I on July 10th continued the discussion from the afternoon of the previous day. Prof. Luigi Lombardi (Italy) presided and 14 papers were submitted. It was explained that finances and the demands for lower freights had prevented the hoped-for results from railway electrification in America. Nevertheless, electrification was extending and the prospective needs were for five million kW of generating plant to be installed, the tendency being to connect the railway systems with the general supply systems. Such things as an excess of Government regulations had resulted in electrification being carried out in a somewhat piecemeal fashion, but the conditions were improving. The chief reason for the conversion from steam traction was not the saving in coal, but the increase in traffic that was made possible; in many instances steam roads had reached the limit of their capacity and the maximum power per train with steam traction had also been reached. With electric traction, however, a power of 20,000 kW per train was available and the new locomotives for the Virginia railway had a tractive effort of 70,000 lb. Electrification had been carried out in some cases at no greater cost than would have been necessary to obtain similar results by modifying and increasing steam traction; therefore, the other advantages of electric traction accrued as a net gain.

In the absence of the author, the chairman briefly summarised Prof. F. Tajani's paper on electric traction in Italy, which outlined the history of tramways, all of which were considered to be successful, and referred to the various systems that had been tried for railways. The difference in cost between the 3-phase, single-phase, and d.c. methods being very little, it was difficult to state in general terms which was the best. In northern Italy, where 3-phase traction was in use, it would be extended; but in the central and southern parts of the country the d.c. and other systems would be tried.

Mr. H. J. Schreiner, reviewing the conditions in Norway, which had no coal, but greater water power in proportion to population than any other country, said that power for the railways would be derived partly from special stations and partly from the general system. Interference with communication lines had had to be considered, and it was decided to lay underground cables instead of aerial lines. By suitably constructing generators and transformers and providing arrangements for limiting short-circuit currents, practically no disturbance was now experienced. The Scandinavian speakers considered that railway electrification should proceed as quickly as possible; single-phase traction was to be tried and was the correct system to use where 3-phase energy was not needed for other purposes.

In reply to a doubt expressed as to whether a new 3-phase system mentioned the previous day would not cause harmonic troubles, it was explained that all methods of minimising 15-cycle interference would be good, too, in the case of 50 cycles. In cases where 700 volts had been induced in neighbouring telegraph lines, a 5-wire grounded shield between the line and railway had reduced that figure to 27 volts, which, however, was not considered low enough for telephone systems, so that earthed choke coils had been used in place of the screening wires.

Dr. Semenza (Italy) thought that 3-phase traction in Italy was a remarkable piece of engineering work, but it would not be the system of the future; the 3-phase motor was not a traction machine and those who had compelled it to do such work were to be admired. Raising the frequency increased the drop in the line voltage, and therefore something like 9,000 volts would be needed in the contact line if economy was to be secured; that was no easy problem, but he thought its solution would be approached in the near future. D.c. traction was being experimented with in South Italy in order to have a fair comparison with the 3-phase system and an interesting secondary line, which might be termed a mountain railway, had worked well and quite safely at 4,000 volts d.c. with four motors in series.

In the absence of Sir Philip Dawson, whose presence in the House of Commons was obligatory, Mr. Roger T. Smith read a letter from him wherein he pointed out that the principal reason for writing his paper was a desire to emphasise the fact that main-line electrification would not only pay, but would pay even better than suburban electric lines had done. "Super power" stations could only be successful if substantial loads could be found for them at the beginning, and as the numerous older stations could not be shut down immediately, the only solution was the railway load. Moreover, railway electrification would carry transmission lines into every part of the country and thus make electricity available in many localities sooner than it would otherwise be. Another delegate explained that not much had been done with 3-phase traction in the U.S.A., principally because it necessitated the duplication of the overhead line. The d.c. motor was still the best and it would probably be used in conjunction with converters on single-phase systems. It was not yet possible to say whether the 3-phase or single-phase system would be the first to disappear, but the latter was not popular in America. The "load factor of the track," or line as a whole was most important; attention had been drawn to it in a paper at the Turin Congress 13 years ago, but it seemed to have been neglected or forgotten. The study of the traffic would give a "track factor" that would show at a glance whether it was worth while to electrify or not. "What service does a particular line provide and what is it going to do?" were the fundamental questions. If railroads were electrified before they were ready for it, harm would be done to others which could be legitimately converted.

A delegate who was a member of the Committee which had considered the possibility of electrifying the North-Western and Simla mountain railways in India, said that in that country the railways were almost level, anywhere up to 1,000 miles long, and carried dense traffic; the conclusion come to was that for main lines the energy must be obtained from the 50-cycle general system, using a high voltage on the trolley contact with sub-stations far apart, and low-pressure a.c. motors on the locomotives. In that connection, the transverter might be of assistance. Probably the single-phase system was the best, where the load factor was low, while d.c. traction was more suitable for dense traffic.

(To be concluded.)

Some of the Exhibits at Wembley.

The Automatic Telephone Manufacturing Co., Ltd.

(Stand No. 101, Avenue 14, Bays 14 and 15.)

The accompanying view of this company's stand (fig. 186) shows the Strowger automatic and manual telephone apparatus arranged to represent a large exchange network introducing director equipment as now being manufactured for the General Post Office for London.

The various classes of traffic which can be dealt with by the group of demonstration exchanges are briefly summarised below, and will afford an idea of the complexity of the switching operations involved, which are rendered simple by the introduction of the director:—Manual to manual, through mechanical tandem exchange; manual to automatic, with key sending at mechanical tandem exchange; automatic to automatic, direct dialling through local director (subscribers in different exchanges); automatic to automatic, direct dialling through director and mechanical tandem exchange; automatic to manual, with coder call indicator at manual exchange; and automatic to automatic, direct dialling through local director (subscribers in the same exchange). All the above exchanges are linked together by means of the director system, by which it is possible to co-ordinate all the telephone exchanges in a large metropolitan area in one comprehensive scheme combined with a uniform and standardised method of calling or dialling subscribers. The method of dialling subscribers under this scheme is briefly as follows:—To call a subscriber in the London area it is necessary to dial the first three letters of the exchange name, together with the number, *e.g.*, BIShopsgate 2345 would be called by dialling BIS 2345, the whole combination being easily remembered. The function of the director switch is to translate the office code numerical equivalent (in the case of BIS this is 247) into the various steps required by the switching equipment to route the call to the required exchange in the network. After this the director transmits the numerical part, usually consisting of four digits, and completes the selection of the required subscriber in the distant exchange. The remaining operations, such as ringing, furnishing "busy" signal if line is engaged, switching through if line is available, metering of the call, and instantaneous disconnection on hanging up the receivers are accomplished by the standard Strowger automatic methods.

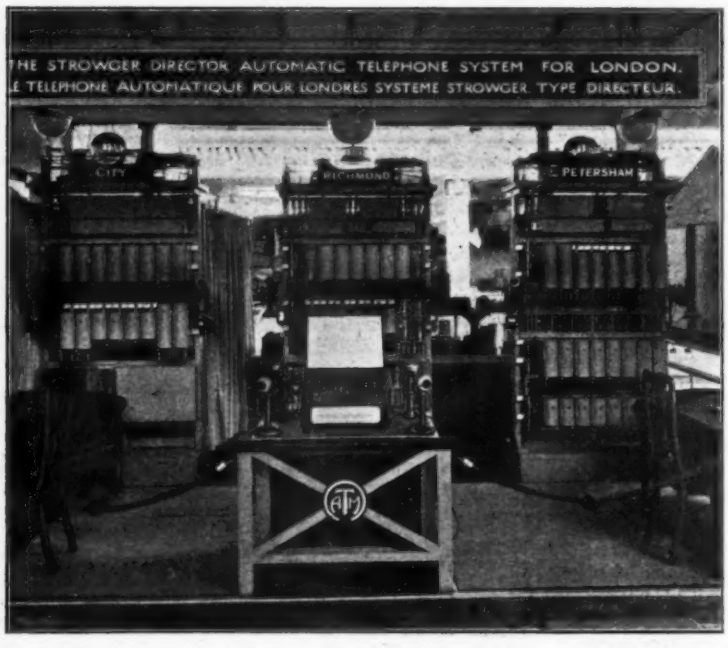

Fig. 186.—"A.T.M." Strowger Automatic Telephone System.

The mechanical tandem exchange which will be employed in the London area simplifies very greatly the difficulties which are met with in handling the large amount of junction traffic met with in a metropolitan network, especially during the transition stage, from manual to automatic working. For economic and financial reasons it is obviously impossible to convert at once all the telephone exchanges in the area to automatic working, and for a considerable period of time the network will be composed of both manual and automatic offices. A complex system of cables underground or overhead is required in an exchange network in order to meet the demand for the most rapid communication between any two exchanges. A simplification in inter-office trunks is effected by the introduction of a mechanical tandem exchange. The financial saving in a large city where expensive underground cables are employed will be obvious. An additional advantage lies in the fact that when a new exchange is introduced into the network it is only necessary to provide one set of interconnecting trunks to the mechanical tandem exchange in order to obtain connection with every other part of the network as against a large number of trunks required under the earlier system. In addition to the cabling economies secured, the exchange introduces automatic switches for completing the connections which were previously performed manually and effects operating economies by the elimination in many cases of one or more "B" operators previously required by junction working under the existing manual system. The connections are completed much more rapidly, key sending equipment is employed to set up the calls, and there is less chance of error.

Handling of the traffic on a manual exchange is greatly facilitated by the introduction of the coder call indicator system, which provides a device for displaying visually the digits composing the number of the call required. These are set up automatically either by a subscriber at an automatic exchange dialling in the usual manner, or through the medium of a cordless "B" operator at the mechanical tandem exchange. So far as the automatic subscriber is concerned, the call to a manual subscriber is completely automatic. The manual subscriber secures a connection with the automatic exchange by giving the number as usual to the "A" operator in his local manual office. The call is then routed *via* the cordless "B" operator at the mechanical tandem exchange to the distant automatic office.

The demonstration working model of the Strowger automatic telephone system, which is illustrated in fig. 187 comprises two automatic telephones and the switches used for completing connections at a 1,000-line Strowger exchange. Associated with the telephones are life-like replicas of human hands and wrists, which by concealed mechanism are caused to lift the receiver and subsequently operate the dials of the telephones as in the act of calling a number. Each of the telephones is brought into action alternately, thus demonstrating calling in two directions. Following the conventional movement of the hands, the exchange mechanism responds step by step as in actual practice. The procedure of the call is graphically illustrated by means of coloured arrows, which automatically come into view and indicate the extension of the call step by step.

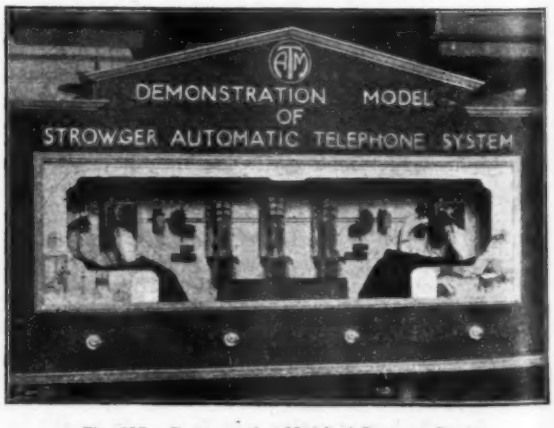

Fig. 187.—Demonstration Model of Strowger System.

The telegraph display represents two high-speed duplex land stations working through a repeater office. Features of interest are the "A. T. M." simplified Wheatstone transmitters and receivers, undulators, and Palmer keys. Working demonstrations are given by arrangement.

The working model of an early form of automatic trunking switch, which is seen in the centre foreground of fig. 186, is of considerable historical interest in that it shows a very

early form of automatic trunking which was devised some 40 years ago by Messrs. Sinclair and Corbett, and installed at Coatbridge and elsewhere by the National Telephone Co. in the 'eighties. The model is arranged to effect automatic trunking between any one of a group of six subscribers' stations and a distant exchange, the circuits being of the early type, viz., single line and earth return.

Messrs. W. T. Henley's Telegraph Works Co., Ltd.
(*Stand No.* 18, *Avenues* 9 *and* 10, *Bays* 15 *and* 16.)

Typical examples of practically the whole range of the company's manufactures appear on this stand. Most of these are too well-known to require detailed description, but mention

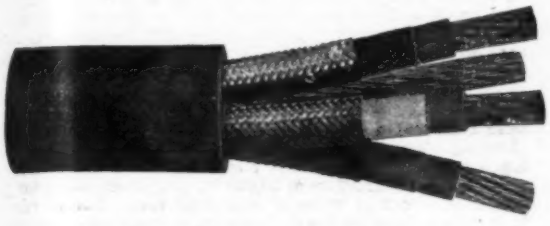

Fig. 188.—"Henley" improved Trailing Cable.

may be made of the many types of cable represented, including paper-insulated conductors for pressures up to 60,000 V; other types insulated with vulcanised bitumen and india rubber; telephone cables containing up to 1,000 pairs of

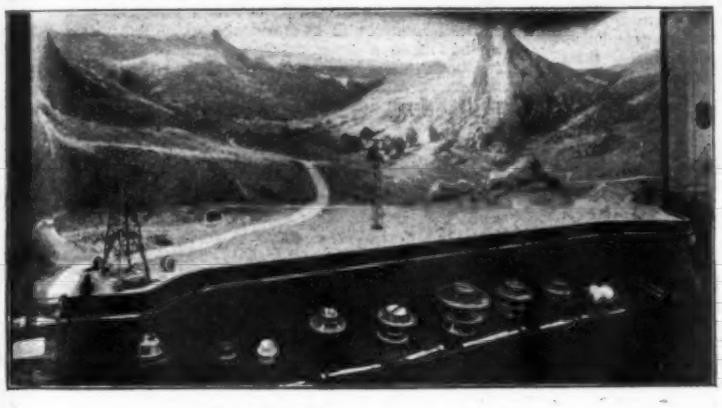

Fig. 190.—A Model Transmission Line.

wires; varnished cambric insulated cables; enamel insulated and silk and cotton-covered wires, &c. One special departure in the cable section is an improved type of trailing cable which is especially applicable to mines and docks. For these purposes it was considered that the cable which employed an earthing conductor consisting of a copper braid embedded in the rubber insulating sheath was inadequate. Accordingly, the new trailing cable is provided with earthing conductors consisting of a braiding of fine tinned copper wires on each core, in addition to the uninsulated earthing conductor specified by the Mining Rules. The conductors are composed of tinned copper wires insulated with pure and vulcanised rubber. The cores are laid up with a bare tinned earthing conductor not less than .0225 sq. in. in section, and the whole is sheathed with solid rubber. It is impossible to cut through the sheath and any of the live cores without immediately earthing the fault, or for a "short" to occur between cores. The separate earthing wires on each core enable the insulation of the individual cores to be tested, and the accidental omission to earth any one or all of the cores does not deprive the cable of protection, as the main earthing conductor will provide this. A view of a typical cable of this nature appears in fig. 188.

A number of cable accessories form another section of the stand; these include joint and terminal boxes of various patterns, cable racks, &c. One item is a patent vulcaniser, illustrated in fig. 189. This consists of a riveted galvanised sheet-iron trough, mounted upon stout iron supports and provided with handles. In this trough are three banks of heaters covered with a suitable oil. An internal trough containing the vulcanising compound is supported within the first trough just clear of the heaters, and this is surrounded by the oil which forms a jacket. A terminal board and switches and a drain cock are provided. The heater is tested with 2,500 V between the heating circuit and the testing socket. The

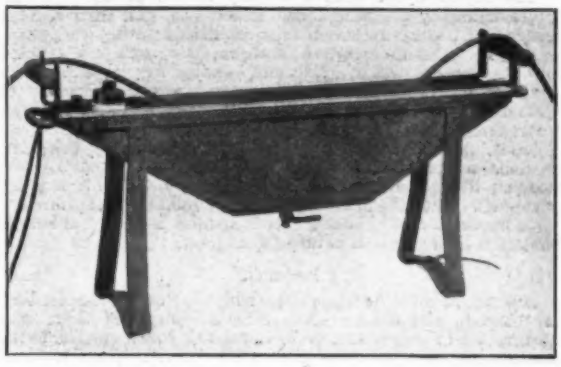

Fig. 189.—The "Henley" Vulcaniser.

circulation of the oil prevents the overheating of the coils and burning of the compound, any sediment from the compound does not clog the heaters, and contact of the cable with the heaters is impossible.

At the back of the stand is a panoramic view upon which is superimposed a model overhead transmission line mounted upon steel towers. In front of this, examples of e.h.p. line equipment are placed (see fig. 190).

The other exhibits include house service gear such as cut-outs distribution boards, &c. The "Henley" wiring system is also dealt with by means of samples of conductors and special fittings.

Messrs. Browett, Lindley & Co., Ltd.
(*Stand No.* 84, *Avenue* 13, *Bays* 10 *and* 11.)

One of the principal features of this stand is a four-cylinder enclosed forced lubrication, single-acting gas engine (fig. 191) running at 428 r.p.m., direct-coupled on a combination baseplate to a dynamo by the Lancashire Dynamo & Motor Co., Ltd., compound wound for an output of 100 kW at 220/230 V.

Another exhibit is a two-crank, two-valve compound vertical double-acting steam engine with forced lubrication, to operate at 500/550 r.p.m. with a continuous load of 150 b.h.p., at steam pressures between 120 and 150 lb. per sq. in., condensing or non-

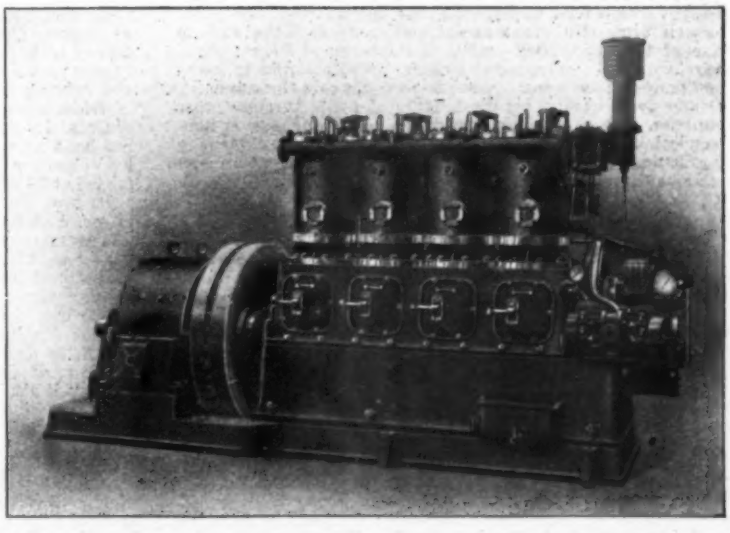

Fig. 191.—A "Browett-Lindley" Gas Engine and "Lancashire" Dynamo.

condensing. The company also shows a two-crank forced lubrication vertical steam-driven air compressor.

The Industries and Commerce of Spain.

The Department of Overseas Trade has issued a report upon the above subject,* received from our Commercial Secretary at Madrid (Capt. U. de B. Charles, C.B.E.).

The report opens with a lengthy review of the financial position during the year ended March last, and then surveys general economic and commercial conditions during the period. All branches of industry, it is stated, were seriously affected by the general world conditions, particularly in connection with depreciated exchange "dumping," which, according to Catalan industrialists, was not efficiently checked by the high protective tariff. In spite of an outcry against commercial treaties, it would appear that these have actually benefited Spanish trade. The iron and steel industries appear to have escaped the general depression owing to orders for railway materials. Capt. Charles expresses the opinion that even the high import duties will not revive Spanish industry unless at the same time an effort is made to improve the efficiency.

Imports.

The report contains figures showing that under the heading of "Metals and manufactures thereof" imported there was an increase in copper and brass tubes and wires, copper, brass and bronze cables made of a wire of a diameter of 0.5 mm. or more, from 757 kg. to 444 tons, aluminium plates, sheets, and bars—from 259 to 486 tons, and many other items. Under this heading practically all of the imports of copper cables (about 500 tons) were from the United Kingdom, and of 697 tons of copper and copper-alloy plates, this country supplied 305 tons. From the same source, Spain imported fuel economisers to the equivalent of 252 tons. Under "Machinery, apparatus and vehicles," it is noted that steam turbines increased from 19 to 167 tons, electric locomotives from 2 to 488 tons, water-tube boilers from 35 to 179 tons, and dynamos, transformers, &c., from 3,160 to 3,930 tons. In all other classes of electrical material, with the exception of accumulators weighing less than 50 kg. and dry batteries, there were heavy increases in imports. The United States supplied 375 tons of the electric locomotive total mentioned above. Of 2,000 tons of elevating machinery, the United Kingdom supplied 603 tons, holding the first place. In many other branches, too, this country maintained its favourable position. Germany supplied the greatest quantity of dynamos, &c., *viz.*, 1,600 tons; Great Britain, with 500 tons, occupied the fifth place.

Exports.

Practically all the richer quality of copper ore (containing more than 2½ per cent. of the metal) exported came to this country, while the United States took the largest quantity of the poorer ore, 307,000 tons; Great Britain received 59,000 tons of this. This country was also Spain's best customer for lead. As regarded zinc, France took the largest portion of the 2,900 tons exported, the United Kingdom coming next.

Foreign Competition.

Both the United States and this country have suffered from the competition of countries with a favourable exchange. In spite of the Anglo-Spanish treaty, our exports to Spain have fallen, while, on the other hand, Spain's exports to us have improved; thus the balance in favour of Spain has risen from £7,884,246 in 1921, and £5,771,307 in 1922, to £8,205,023 last year. The alteration is accounted for by Spain's smaller coal and textile imports, and larger exports of iron ore and copper.

There is no falling off in the activity of German agents, and German commercial propaganda has in no way decreased. German firms still grant exceptional credit facilities and, in spite of the depreciated exchange surcharge of 80 per cent., they can still undercucte British manufacturers in many essentially British lines. There is no doubt that the surcharge is extensively evaded by the sending of goods through other countries. France and Belgium had a successful year in non-electrical lines, the latter country supplying a great quantity of rails and other steel products. Switzerland finds Germany a serious competitor in dynamos and electrical apparatus.

Methods of Business.

Two or three pages of the report are devoted to this subject, but with the space at our disposal we can do no more than indicate the general lines of the advice given. Traders are urged to be careful in appointing agents, but at the same time not to despise the "small man." Commission should be such as to conduce to energetic endeavour. Small orders should receive careful attention, and customers should be aided by the use of the metric system; information from bureaux or banks regarding new customers should not be too closely relied upon. The trader must not expect to receive payment before the goods are inspected; Spanish firms, on the whole, are as reliable as British concerns. The co-operation of a British bank in Spain in the granting of credit terms should be secured. Warnings regarding the postal services and the Custom House are sounded. Owing to exchange fluctuations, goods should be despatched promptly; shipping instructions should be complete to the last detail. When tendering for Government contracts, specifications, &c., should be in the Spanish language; those in English are "worse than useless."

*Stationery Office, 2s. 6d. net.

Railways and Tramways.

Four new railway lines were put into service during the year; one of these, a line from Cercedilla to Guadarama 12 km. in length, is electrically operated. In Cataluña the work on the two metropolitan railways progressed steadily, and it is anticipated that part of the "Gran Metropolitano" will be in operation by the end of this year. Owing to the high costs of materials, &c., the question of the electrification of the Bilbao-Las Arenas and the San Sebastian-Bilbao lines has been postponed. In Guipúzcoa, the following railways and tramways have been amalgamated under the title of Sociedad Explotadora de Ferrocarriles y Tranvías, S.A.:—The San Sebastian to the French frontier (electric), the San Sebastian to Hernani (electric), the Irun to Fuenterrabia (electric), and the Pamplona to Lasarte (steam); the total capital involved is 15,000,000 pesetas. The electrification of the portion of the Norte railway, known as "Puerto de Pajares," on the section from Leon to Gijon, was expected to be completed this month (August). Trials of the General Electric Co. (U.S.A.) 1,680-h.p. locomotives have proved them successful. Direct current at 3,000 V, converted from 30,000 V, a.c., is employed for the stretch of about 15 miles of electrified line. Twelve electric locomotives have replaced 28 steam engines owing to their better performance on the steep gradients encountered. The only development of importance in the Seville district during the year was the construction of three miles of tramway connecting San Juan with the Triana station of the Seville-Huelva Railway. Attempts are being made to raise money for the construction of a line from Huelva to Ayamonte, and interest is revived in a light railway from Jerez to Puerto de Santa Maria. In the Madrid district an electric line from Cercedilla to Puerto de Navacerrada was opened for traffic, and the Madrid underground railway was extended. The latter venture has been a great success. A large number of petitions have been presented to the Government for concessions to build small electric lines and tramways during the past year. Amongst those granted, on which work has been commenced, are a funicular railway to join the mining villages of San Salvador del Valle and La Reineta (Vizcaya), and a tram line from Pontevedra to Lerez and Marín (Galicia). Other petitions, not granted at the date of the report, are the electric railway from Sardanyola to San Cugat (Cataluña), funicular railways from Planas de Vallvidriera to La Rabasada, and from Montserrat to Callrate, and the suburban line from Barcelona to Badalona. There is also talk of building an underground railway in Bilbao.

Railway materials and locomotives have not been ordered from Great Britain owing to the unfavourable prices as compared with other foreign quotations and those of home concerns. The Babcock & Wilcox Spanish Company was successful in securing locomotive orders.

Hydro-Electric Works.

Practically all of the hydro-electric development during the year was in continuation of schemes already in hand, and several new works were completed. From the Saltos de Cinca (Aragon) undertaking 28,000 kW is transported 290 km. to Bilbao for the "Hidroeléctrica Ibérica" at 132,000 V. This is reported to be the highest voltage under which electric current is transmitted in Europe. The power station for this line is at La Fortunada (Huesca), which has been built to deal with 100,000 kilowatts, and will be one of the most important in Spain when it is completed. *La Sociedad Anónima de Fuerzas Motrices del Valle de Lerin* has inaugurated a station of 4,000 h.p. at Durcal (province of Granada), which will supply power for the electric railway from Granada to Motril and lighting for Almería. *La Sociedad Productora de Fuerzas Motrices* has opened a new station on the Garona river (Valley of Oran) for the supply of 16,000 h.p. *La Sociedad Mengemor* has built a transmission line of 100 kilometres from Córdoba to Villanueva de las Minas (Seville). Power is being transmitted at 70,000 V from a new station at El Carpio, developing 3,500 h.p. In addition to those mentioned above, a number of small stations of 100-500 h.p. have been completed, and it is estimated that the available horse-power has been increased by some 80,000 during the year.

The most important schemes on which work is progressing are the following:—*Salto de Villalba de la Sierra* (Cuenca): 15,000 h.p. for the Hidroeléctrica de Castilla; *Salto del Tambre* (*Galicia*): 16,000 h.p. for the Gallega de Electricidad; and *Salto de Argoné, Cataluna*: 5,000 h.p. for the Sociedad Catalana de Gas y Electricidad.

Work is also proceeding on the Viesgo power station, which will be used for the electrification of the Puerto de Pajares section of the Norte Railway, to which reference is made above. The Sociedad de Fuerzas Eléctricas of Valencia, in which British firms are interested, has met with some difficulty in completing its plant, but should be able to start distribution of current this year. Amongst important concessions on which work has not yet commenced are those at Cofio and Alberche, less than 80 kilometres from Madrid, which would supply much-needed additional power to the capital. The Sociedad Mengemor, too, has an important concession on the River Guadalquivir, between Córdoba and Seville, with falls capable of producing 65,000 h.p.

Much capital will be required for any considerable development of this all-important industry, and it appears to be within the bounds of possibility that the Government may consider the advisability of assisting development by grants or other inducements for the investment of capital.

Electrical Machinery in Industry.

An appendix to the report shows that there was a decline in the amount of electrical plant employed in various industries during 1922. In the mines this decline was most marked. In 1920 the installed h.p. was 60,270; in 1921 it fell to 45,883; and there was a further decrease to 42,693 in 1922. In furnaces, foundries, and rolling mills the figures were:—1920, 73,610 h.p.; 1921, 77,188 h.p.; and 1922, 69,481. The explanation probably lies in the greatly reduced output of coal.

Social and Industrial Conditions.

The advent of the Military Directorate has brought with it tranquillity in industry; strong action has been taken against strike leaders, and improved relations exist between masters and men. The cost of living continues to rise in spite of the efforts directed against food "profiteering" by the Directorate. There were a few strikes during the year, including an extensive dispute in Barcelona, which involved the employés of the tramway and underground railway undertakings.

Costing and Industry.

The Third Annual Costing Conference.

THE third annual conference of the Institute of Cost and Works Accountants was held at the Connaught Rooms on July 25th. Viscount Leverhulme opened the conference with a characteristic speech. He said that the Institute was rendering the greatest possible assistance to commerce in this country by giving accurate figures of costs. It never favoured the consumer that manufacturers should be making and selling goods without an accurate knowledge of their costs. The old days were gone when prices were fixed haphazard; the institute was supplying manufacturers with systems of ascertaining costs far superior to anything available in the past.

The diction of this speech was simple, vigorous and direct, and one wonders why other exponents of commercial and scientific subjects do not endeavour to cultivate a similar style. A very little information served in an attractive and easy manner would be remembered long after much matter delivered in the conventional style which some commercial men adopt.

Administrative and Selling Costs.

Submitting a paper on "Administrative and Selling Costs, their Nature and Distribution," Mr. Andrew Stewart, Fellow of the Institute, said that the Council was to be commended in bringing the subject of selling costs prominently before the conference. It was the "Cinderella" of cost accounting. The high cost of distribution was an outstanding feature of modern conditions, and a problem which had grown along with the development of the commerce of this country. We had been so intent on the manufacturing aspect of industry that selling and distribution costs generally had been relegated to the background, but they were now so important that it was no longer possible to ignore them. We were a people who must live principally by exports, and to retain our position in world trade, we must develop to an increasing extent our markets beyond the seas. This meant that the problem of distribution costs was going to be one of still greater importance.

The onlooker saw most of the game, and it was a surprising spectacle to see executives demanding every means of control of manufacturing expense, and at the same time to know that the same men were content to maintain expensive selling forces in the field, without any effective control.

Whatever system might be devised for dealing with selling costs it was fairly obvious that it must provide for:—(1) The means of control of the selling organisation. (2) A method of ensuring that the selling price was correctly fixed in relation to the cost not only of manufacturing but including distribution also.

If suitable data did not exist then years of groundwork might be necessary before reliable standards could be evolved. Keeping in mind the dual purposes of price fixing and of control, it would seem that the most useful information could be derived by the classification of selling expense by lines of product and if possible by lines of product in each branch or agency. Such information would be essential because of the different margins of profit.

The cost of administration must, in the first instance, be apportioned between manufacturing costs and selling costs.

Mr. Stewart's remark that in times of stress it might be found worth while to accept orders which would merely make a useful contribution towards standing charges, must have voiced the feelings of many to whom this has lately been a matter of course. Hence, he said, the value of knowing real factory costs as distinct from all other factors.

A further paper on the same subject was read by Mr. W. H. Higginbotham, F.C.W.A., who remarked that the work of organisation was constructive and finite; the purpose of administration was conservative and continuing, and appeared to involve the pre-existence of something which was to be served, managed or directed. He suggested that the process of organisation in human affairs should be regarded as that of grouping individuals in such a manner as to form a recognisable entity; whereas the function of administration was the control, direction and service of the endeavours of those individuals in the furtherance of a common purpose.

In attempting to typify the form and mode of action of the productive organism, the speaker said he could offer no better or more appropriate illustration than the human body itself—admittedly the most perfect example of organisation; capable, as it was, of maintaining its varied activities under the most diverse (and adverse) conditions of existence. He then developed this analogy on scientific lines, and proceeded to explain the various groups of functions.

The form of this lecture was analytical and thus difficult to summarise. It can only be studied as a whole.

Costing and Industrial Relations.

Papers on a less technical subject were submitted by Mr. J. A. Lacey, F.C.W.A., and Mr. H. G. Jenkins, F.C.W.A., both of whom spoke on "The Function of Costing in Industrial Relations." Few people would deny, said Mr. Lacey, that the commercial status of this country had been seriously handicapped by the rapidity of the onward march of other countries who had become competitors in the world's markets. We no longer occupied the unassailable position that we once enjoyed. There might be a multiplicity of reasons adduced for this. It was perfectly true that the British manufacturer hesitated to depart from procedure and customs that were considered good practice in the past; he had no repute for nimbleness in throwing down or discarding systems, processes or policy which were threatened by competitive organisations. He had been sluggish in the appreciation of these efforts upon his costs and had penalised himself in consequence.

From our earliest schooldays we had been taught how rich this country was in mineral wealth. Unfortunately, it took us the rest of our lives to understand the supreme importance and gravity of the conservation of our national wealth; neither did we fully realise the exact position of industrial concerns who won for the nation this wealth.

Trade was bad, and after seriously thinking of its condition, we were left with the root cause, namely, "the lack of purchasing power."

It would seem that the only way to stimulate the power of purchase was to create that condition whereby an addition was made in goods or service to the quantity or quality hitherto purchaseable for the same price. Here, then, was the vital element in the restoration of national and commercial prosperity; the endeavour as to what was the maximum amount of production with a given price unit.

We marked the gigantic prosecution of commercial enterprise by such bodies as the Federation of British Industries, the National Union of Manufacturers, and others. It was these bodies to which one must look to find the intention and extent to which the product might be increased in return for the purchasing unit. Before, however, they could voice their sentiment or specify definitely, reference must be made to the fundamentals of business statistics—"Costs of Production." On this point, the speaker mentioned that in order to avoid ambiguity or misrepresentation, groups of traders were introducing standard systems so that different firms and different bodies, could present facts in the same way, results which had been arrived at by the same method.

There was not a single economic problem yet propounded which was not bound up with the expenditure involved in its realisation. The accurate registration of that expenditure and the application of the principles governing that involved operation was a further objective of the Institute. No one could deny the vital necessity in industrial discussion of placing at the disposal of the contestants all relevant matter and data; but the fullest appreciation of this as it concerned master and men, could only be engendered by the personal effort together with the personal contact of the cost accountant.

Mr. Jenkins followed: It was only during the war, when protection against exploitation by some of those whose help was essential, that costing became more generally recognised as a function of industry which could benefit industrial relations. The present state of affairs was largely due to ignorance; ignorance on all sides.

The consumer had no guide, no criterion except the extremely crude one of popularity, which was so fickle as to be worse than no guide at all.

What had already been done in the coal industry and the printing industry indicated that here was a field which the

cost accountant could explore for the common welfare. If an examination could be made it would be found that the industrial concerns who had best weathered the storm were those whose prices had attained a real relation to cost.

The ignorance of Capital, which must not be regarded as embracing management, was colossal. Did the individual who was normally referred to as the small investor interest himself in the industry with which he was concerned? It was obvious that the publication of the cost aspect of industrial investment would bring an altogether greater knowledge to Capital and contribute to stability of investment, eliminating much of the speculative element and its influence in industrial relations.

It was certainly not possible to allege ignorance of the worker to the same degree as formerly. It might even be suggested that within his own sphere he was one of the best informed parties. Outside this, he had undoubtedly been kept in darkness. How could he be expected to gauge the wage that he could anticipate from his efforts unless he had some information to guide him?

These aspects cover in general terms some part of the contribution which the cost accountant could make to the improvement of industrial relations for, after all, the best way to ensure trust and banish suspicion was for all parties to have sufficient information and knowledge to know that they were getting a fair deal, the worker a fair share of the products of his industry, and the management honest effort on the part of labour.

Mr. A. Williamson, who presided, said he did not think progress would be hastened until the various industries of this country decided to make available information on the costs of production.

The Glasgow Electricity Undertaking.

Annual Report.

We have received a copy of the thirty-second annual report, covering the year ended May 31st, of the Glasgow municipal electricity undertaking (engineer: Mr. R. B. Mitchell).

Both revenue and working expenses increased during the year, the former from £1,033,602 to £1,153,194, and the latter from £478,165 to £571,119. There was thus an increase in the gross surplus from £555,437 to £582,075. The interest on loans, amounting to £248,039, was slightly lower than in the previous year, but larger amounts were charged against the surplus for sinking fund (£234,941) and depreciation (£93,121 as against £79,165), reducing the net profit from £9,508 to £5,975. This balance was transferred to the reserve fund, bringing it up to £75,798. The increase in the revenue is regarded as satisfactory, although lower than in 1920 and 1921, in view of the depressed conditions which continued to prevail. The increase in the working expenses is attributable principally to the increased price of coal, which was accompanied by higher rates and taxes, the cost of a general overhaul and repair of buildings and plant, and to the Superannuation Fund, which appears for the first time, an initial contribution of £8,753 being made. Further increases in rates are anticipated owing to the advance of the assessment of value from £299,741 to £362,690. During the year a total of £394,028 was spent on capital account, bringing the total capital expenditure up to £7,068,472 (from which £1,310,417 has been written off for depreciation). The year's expenditure includes a total of £127,599 in connection with the Dalmarnock station (which has now cost almost two millions); £14,307 on the Bridgeton sub-station; £6,361 on the Virginia Street sub-station; £5,928 on the Parkhead sub-station; £155,997 on mains and services; £10,089 on meters and indicators; £24,751 on apparatus for hire; and £17,688 on the purchase of premises for showrooms.

The generating statistics show that the total amount of energy sold increased from 141,919,196 to 166,087,836 kWh. Only 1,169,000 kWh was supplied from the Port Dundas station, the bulk being generated at Dalmarnock. The average gross revenue per kWh sold was 1.666d., as compared with 1.748d. in 1922-23. The total cost per kWh sold was 1.658d., as against 1.732d. The total maximum supply demanded was 193,214 kW; in the preceding year it was 180,490 kW. The prices charged for energy remained the same as in 1922-23, and the Electricity Committee, having in mind the probability of a decreased consumption during the current year, on account of the industrial position, recommends that the charges be maintained at the present level, the position to be reviewed at the end of November next.

Dealing with the Dalmarnock station, the report states that the present buildings are now fully equipped with plant to the total capacity of 93,750 kW, and a start has been made with the extensions. The two turbo-alternators, with the necessary boilers and switchgear, which are on order, should be ready for load by August, 1925. The extension of the railway bridge over the Clyde is nearing completion, and part of the coal sidings is now in use. The water-screening plant on the river bank has been greatly improved, and it is hoped that there will now be sufficient surface to ensure a plentiful supply of water at all times.

The Conference on Illuminating Engineering.

At the Conference on Illuminating Engineering, which was held at the British Empire Exhibition on August 12th, the chief item was a paper by Mr. L. Gaster, in which he discussed the best means of promoting public appreciation of the benefits of good lighting. The opportunity was taken to review the proceedings at the First International Conference on Industrial Hygiene, and the meeting of the International Illumination Commission, both held in Geneva last month. Mr. Gaster himself reviewed recent developments in codes and regulations on factory lighting, and the Conference endorsed his view that good lighting, in common with ventilation, heating, &c., should be regarded as essential to the health of workers. It is hoped that this Conference will pave the way for regular consultation on lighting by hygienic experts and illuminating engineers, and that the International Illumination Commission and the International Labour Bureau of the League of Nations will work together in bringing industrial lighting and similar questions before the notice of the Governments of the various countries.

At the International Illumination Commission the subject of industrial lighting was again discussed. There was general agreement that regulations should be based primarily on obtaining conditions desirable in the interests of health and safety of workers, though *recommendations* in the interests of efficient production would be welcome. There were also many papers dealing with such matters as symbols and nomenclature, visibility, &c. But the three that Mr. Gaster chiefly referred to were those by Messrs. Lieb, Merrill, and Powell, showing how the great movement for better lighting had been conducted in the United States. These papers made clear the very close co-operation between electricity supply companies and makers of lighting appliances, but they also emphasised the important part played by the Illuminating Engineering Society in correlating all these activities. The need for action by independent and impartial bodies was there fully recognised, and in future researches on the results of better lighting are to be conducted by the National Research Council.

Mr. Gaster therefore advocated similar joint effort on a large scale in this country, and mentioned as indications of future work the organisation of public lectures, simple addresses in schools, demonstrations of good lighting by supply undertakings throughout the country, and the publication of authoritative articles in the Press.

There was a good discussion, in which Mr. W. R. Rawlings, Mr. Murray Griffiths, Mr. Raphael, Miss R. E. Squire (Home Office, Factory Dept.), Mr. J. Eck, Mr. W. T. Dunn (Institution of Gas Engineers), Mr. W. E. Bush, Mr. W. E. Rodgers (B.E.A.M.A.), and Mr. L. E. Buckell took part, and two resolutions were passed approving the intention of the Illuminating Engineering Society to co-operate with other bodies in a comprehensive scheme for promoting public appreciation of good lighting.

During this stage of the proceedings Mr. J. W. Beauchamp occupied the chair, but when the next subject was introduced his place was taken by Capt. W. J. Liberty (hon. secretary of the Institution of Public Lighting Engineers). Mr. E. H. Fryer (head of the Roads Department, Automobile Association) then read a paper on "Illumination of Highways from the Motorists' Standpoint." Mr. Fryer dealt successively with the best arrangement of the headlights on a car, the desirable conditions of public lighting, and the use of warning lights to indicate dangerous places, obstructions, &c. He suggested that good public lighting involved even illumination of the roadway, no glare or dazzle from naked lights, no shadows, uniform height of suspension of lights and uniform distance between them, no troublesome shadows, and illumination of danger, direction, and other signs. He also pointed out that motorists had developed the habit of overtaking red lights by going to the off-side, and that a red light was associated with the tail-lights of moving vehicles ahead as well as obstructions. Hence green lights should be used for central obstructions, and a clear indication that a motorist should pass on the near side was very necessary.

This paper also gave rise to some discussion, in which Mr. Fryer's suggestions for street lighting were generally approved in principle, though it was pointed out that they were difficult to realise in practice in their entirety.

The programme was concluded by two papers dealing with the lighting of the Exhibition by gas and electricity, respectively. Owing to Mr. Haydn T. Harrison's unavoidable absence, owing to ill-health, his paper was read by Mr. Cunliffe. The paper outlined the original plan of lighting the Exhibition exclusively by flood lights and concealed sources, but explained that, unfortunately, it was not found possible to carry out the scheme in its entirety. A feature of interest was the use of highly concentrating projectors, rendered necessary by the long distances between buildings, and capable of directing 75 per cent. of the light within an angle of 5 deg.—the greatest concentration yet obtained with an incandescent filament as a light source. With a 100-W 12-V lamp a maximum c.p. of 300,000 was obtained. Attention was also drawn to the design of the familiar spherical globes, and the use of flashed opal to obtain a mild and uniform brightness, notwithstanding the high candle-power afforded. For

the interior lighting a resultant floor-illumination of three foot-candles was obtained, with an expenditure of less than 0.3 watt per sq. ft. of floor surface.

Mr. L. Gaster, who presided over this section of the conference, explained that whilst the Illuminating Engineering Society had offered its services to the Exhibition authorities, it was not in any way responsible for the lighting. The distinction between the conditions of illumination in the Amusements Park (where, it was stated, an average illumination of 2·3 foot-candles was obtained) and in the remaining section was pointed out, and the view was expressed that in many respects the lighting of this Exhibition marked a distinct advance over that provided at exhibitions in the past. At the same time it was recognised that had it been possible to ensure full attention being given to the lighting at an earlier stage of the design, and full provision for demonstrations of the use of light as an essential feature of the Exhibition, much better results might have been secured.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Inefficiency of Boiling Rings.

Mr. Pinkney's reply to "Cuisinier" relative to the above matter does not in my opinion satisfactorily clear what is apparently a misunderstanding.

Although it is generally recognised in this country that boiling rings are inefficient, it does not alter the fact that highly efficient boiling rigs are in use in Canada and America by the tens of thousands and give results which are *entirely satisfactory* to the housewives of those countries.

The fact that they are American made prevents a great number of the "Hiring Authorities" giving their consumers the advantages of this recognised perfected product, preferring, it seems, to give the gas authorities some real matter on which they can condemn electricity.

Not only are they efficient quick boiling rings, but they stand up to *years* of use. They do not break down just when the user wants them most. Further, by using an efficient and reliable boiling ring, irrespective of its country of origin, the supply companies would reduce their maintenance expenses considerably.

We must be 100 per cent. for electricity, and if the best products are made in the South Sea Islands or elsewhere, they are the products to use.

L. G. Hawkins,
Managing Director, L. G. HAWKINS & COMPANY, LTD.

London, *August 15th*, 1924.

I was very much interested in Mr. W. F. T. Pinkney's reply to my letter on the above subject.

He is quite right in assuming that I am one of his company's consumers, but not in suggesting that I only require an electric kettle to complete my own equipment. Had I not had an electric kettle I would not have tolerated for three months a cooker of the type hired out by this company.

Since reading Mr. Pinkney's letter I have only been able to see three of the six dissatisfied consumers mentioned in my last letter, but all three tell me that the advisability of a self-contained kettle has never at any time been mentioned to them. I can assure your correspondent that I was never once advised to hire or purchase an electric kettle when installing my own cooker; neither when applying for it, nor through the post, nor by the lady demonstrator. At none of the public demonstrations given by this company, at which I have been present recently, has an electric kettle been fitted as part of the cooker installation, in every case an ordinary aluminium kettle being used on one of the hotplates. This is not calculated to instil into would-be users the necessity for a self-contained kettle.

Important though it is, the electric kettle by no means entirely counteracts the slowness of the hotplates. Those fitted on the cookers in question are not at all satisfactory for deep-fat frying and the numerous other cooking operations requiring a quick heat.

Mr. Pinkney does not state why the Newcastle-upon-Tyne Electric Supply Co. does not adopt a more up-to-date type of cooker. That there are cookers fitted with more efficient hotplates there is no doubt. Mr. E. J. Ross, in his recent article, mentions a 1.5-kW hotplate which will boil 4 pints in 18½ minutes, and a cooker has recently been reviewed and advertised in the ELECTRICAL REVIEW, fitted with 1.3-kW hotplates capable of boiling 3 pints in 14 minutes. Both of these are a great improvement on the present 2 pints in 16-17 minutes, with a loading of 1.3 kW.

The medium heat of the present boiling-plates is particularly inefficient. Instead of being concentrated into half the total area of the plate, the heat is spread over an area of 8 in. by 6 in., as the medium heat consists of the outer two of the three elements being on, the centre one being left dead. Consuming 860 watts, this heat takes 16 minutes to boil 1 pint in a Bastalite-coated aluminium kettle. At all heats these hotplates require a utensil not less than 9 in. in diameter to take up all the available heat.

In conclusion, I should like to assure Mr. Pinkney that my criticism is not intended to be anything but helpful. No one would be more pleased than I to see the number of cookers in use increase very much more rapidly than it is doing at present, but this desirable state of affairs cannot possibly come about until the manufacturers have evolved a really efficient boiling-plate, as quick in operation as the gas-ring it is going to displace.

Cuisinier.

August 16th, 1924.

Referring to the letter from Mr. W. F. T. Pinkney on page 246 of your current issue, I think perhaps a good deal of the trouble with boiling rings, at any rate, of the type that gets red hot, such as are used in the Carron cooker, may be traced to the fact that many, at any rate of the public, have a preference for bright aluminium kettles. If the users will blacken the bottom of the kettle by the flame of a candle when the kettle is cold they will find a very marked difference in the speed of boiling. This is only, of course, a variation of the well known lecture-table experiment of the two vessels, one of which is usually nickel-plated and the other blackened, which I suppose we all see when we begin the study of elementary physics.

I may say that I tried this many years ago; in fact, it was about 1899, when a pupil of the Newcastle & District Electric Lighting Co., of which the late Mr. W. D. Hunter was then chief. I found that I could heat my tin can of tea in the morning on a little, and of course rather poor, electric stove which the company possessed, much more quickly by blackening the bottom of the can. On the other hand, I admit that in my own house, where I use the above-mentioned Carron cooker, I find it very difficult to induce the domestic staff to adopt this blackening. They seem to think the kettle is not clean unless they take it off.

Robert C. Pierce,
CAMBRIDGE ELECTRIC SUPPLY CO., LTD.

Cambridge, *August 16th*, 1924.

The Retail Wireless Trade.

I was very interested in the letter in your current issue signed "H. Fowler," and I beg to disagree with him.

Any amateur who takes the trouble to read the trade journals can build up wireless sets which will give results equal to and better than those which are sold by large firms at ridiculously high prices.

The contention re sweet shops and barbers' shops is quite correct as far as it goes, but I beg to point out that the majority of trade journals, in their constructional articles, give details of the make and type of the components.

I am of the opinion that these few words will correct an erroneous impression which might be given by Mr. Fowler's letter.

Radio Engineer.

August 15th, 1924.

Church Heating.

Is it intended to pay a fee to anyone competent and willing to help a contractor who does not understand the job offered to him? If not, the cheek of his request is almost equal to his shameless parade of ignorance. The Irish experiences of "Delta" are not in it!

A Modest Consultant.

August 16th, 1924.

Mathematical Treatises.

Will any reader inform me of good standard works, to which there are keys or solutions, on the following subjects?

Co-ordinate Geometry of Three Dimensions.
Differential and Integral Calculus.
Kinetics, Kinematics, and Differential Geometry.

R. S.

August 17th, 1924.

Radium in Austria.

On page 390 of your issue of March 7th last there appeared a notification under the above heading, stating that radium had been discovered in Bohemia, west of Marienbad, that the content of the ore on an average is 5½ per cent. uranium or 0.0177 gramme of radium per ton; that that ore is much richer than the Joachimsthal ore, which was hitherto the only profitably worked deposit in Europe, and richer than the Belgian Katanga ore, "previously the ruling ore in the market."

As we have been closely associated with the radium business for many years past and are now the official representatives of the Radium Belge (Union Minière du Haut Katanga) of Brussels, who are the operating proprietors of the Belgian Katanga ore deposits referred to in your article, we feel it

necessary to contradict some of the statements there set out, and to ask you to be good enough to publish the true facts, which are as follows:—

According to modern standards, an ore which contains only 5½ per cent. uranium is indeed a poor-grade ore and of little interest for the production of pure radium preparations. It is, moreover, quite an established fact that the Joachimsthal ore had a considerably greater uranium content than 5½ per cent.

The Belgian Congo ore is, in turn, something like ten times richer than the Joachimsthal deposits.

It follows, therefore, that this ore, worked by the Radium Belge in the Congo, is the richest radium-bearing ore ever discovered.

In the circumstances, it is incorrect, therefore, to say that the 5½ per cent. ore which has been reported discovered in Bohemia "is thus much richer than the Joachimsthal ore . . . and richer than the Belgian Katanga ore, previously the ruling ore in the market."

As a matter of fact, the Belgian Congo ore is to-day the ruling ore in the market, and judging by all indications, it will continue so to be for a long time to come on account of its extreme richness and extent.

Geoffrey Pearce,
Managing Director,
Watson & Sons (Electro-Medical), Limited.

London, *August 15th*, 1924.

Electricity v. Gas.

I have read with interest Mr. Bradshaw's letter in your current issue. I challenge, however, his figures of the efficiency of gas production and use. As regards the former, I venture to state that from 1 lb. of coal of the value of, say, 13,000 B.th.u., the average output does not exceed the following:—

Gas	3,250	B.th.u. net value
Coke and breeze of 10,000 B.th.u. per lb.	5,000	„ „
	8,250	

Thus, allowing for the negligible amount of heat in the tar (which is not used for heating purposes), the average overall thermal efficiency of the gas works process does not exceed 65 per cent.

With regard to the efficiency of use, Mr. Bradshaw's figure of 75 per cent. as the efficiency of a modern gas fire with flue is no criterion as to the average efficiency of the ordinary gas fire and other apparatus in use. It is extremely doubtful whether the average thermal efficiency of use of gas and coke for lighting, heating, and power exceeds the maximum for a gas engine, namely, 30 per cent.

Thus the combined over-all thermal efficiency of production and use (which is the efficiency that really matters) probably does not exceed 65 × 30/100 or, say, 20 per cent., which electricity can equal.

Now, whilst I disagree with Mr. Bradshaw's figures, I most strongly agree with him in his statement that electricity should be produced in conjunction with gas; in fact, I would go further and state that they should both be produced from one combined apparatus.

Why should not low-temperature carbonisation be carried out with the flue gases from a boiler furnace, and the whole of the coke as it issues from the retort be used in the furnace to generate high-pressure steam? Surely the improvement which would result in the efficiency and cost of production of both commodities would justify the means.

Before we are too far committed to huge generating stations on the usual lines, let electrical engineers pause and consider more fully the advisability of collaborating with gas engineers in the economical production of gas and electricity on entirely special lines. It is obvious that both stand in vast need of improvement, and there is ample scope for research and experiment.

It would be interesting to see further correspondence on this important subject.

A.M.I.E.E.

August 18th, 1924.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

7,921. "Electrical soldering-irons." J. F. Beasley. March 20th, 1923. (219,360.)

7,963. "Variable electric condensers." C. C. Phillips. March 20th, 1923. (219,361.)

10,427. "Wireless receiving circuits." Western Electric Co., Ltd., and S. T. Buer. April 17th, 1923. (219,371.)

10,919. "Means for controlling the liquid level in electrolytic cells and the like." A. R. Knowles. April 23rd, 1923. (219,331.)

10,924. "Electric storage batteries or accumulators." W. Fisher. April 23rd, 1923. (219,382.)

11,065. "Electrical apparatus for generating ozone." J. McBlain. April 24th, 1923. (Cognate application 24,815/23.) (219,387.)

11,091. "Telephone systems." Western Electric Co., Ltd. December 22nd, 1922. (200,017.)

11,207. "Electric discharge lamps." Edison Swan Electric Co., Ltd., and P. Freedman. April 25th, 1923. (219,395.)

11,208. "Thermionic devices." Edison Swan Electric Co., Ltd., P. Freedman, and E. Greetham. April 25th, 1923. (219,396.)

11,409. "Carrying-case for electric lamps and valves." J. C. N. Eastick. April 27th, 1923. (219,407.)

11,410. "Knife-switch for use with electric currents." J. C. N. Eastick. April 27th, 1923. (219,408.)

11,430. "Electric cooking apparatus." H. H. Berry and C. A. Painton. April 27th, 1923. (Cognate application 16,290/23.) (219,410.)

11,432. "Portable electric safety lamps." R. Ziegenberg. April 27th, 1923. (219,411.)

11,443. "Methods of and apparatus for making metal-filament incandescent lamps and the like." British Thomson-Houston Co., Ltd. June 14th, 1922. (199,362.)

11,522. "Tuning devices for radio-telephony and the like." F. K. Woodroffe and R. N. Dawson. April 28th, 1923. (219,414.)

12,705. "Electric accumulators." Fuller's United Electric Works, Ltd., and L. Fuller. May 11th, 1923. (219,429.)

12,803. "Apparatus for short-circuiting the rotor windings of alternating current dynamo-electric machines, motor-converters, and the like." Bruce Peebles & Co., Ltd., and G. Henderson. May 12th, 1923. (219,430.)

12,995. "Wireless and like signalling." W. Dornig. November 29th, 1922. (207,781.)

13,084. "Sound-reproducing apparatus." A. R. Kahl and Sir W. Noble. May 16th, 1923. (219,435.)

13,268. "Electrical process for facilitating the discovery of mineral deposits." Dr. R. Ambronn. May 17th, 1923. (219,437.)

13,616. "Making paper-insulated electric cables." C. J. Beaver and W. T. Glover & Co., Ltd. May 23rd, 1923. (219,443.)

13,921. "Electric welding and annealing apparatus." Western Electric Co., Ltd. August 31st, 1922. (203,295.)

14,245. "Taping machines." Western Electric Co., Ltd. August 31st, 1922. (203,297.)

14,270. "Means for testing faulty electric line insulators and indicating leakage therein." O. W. Brain. May 30th, 1923. (219,449.)

15,092. "Automatic telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. June 9th, 1923. (219,453.)

15,178. "Private automatic exchange systems." Coventry Automatic Telephones, Ltd. (R. C. Arter). June 11th, 1923. (219,456.)

16,050. "Chains for suspending electric-light bowls." F. Stokes. June 21st, 1923. (219,462.)

16,583. "Means for and method of controlling electric current by sounds." L. de Forest. October 28th, 1922. (206,111.)

16,716. "Electrical conductors." Siemens & Halske Akt. Ges. July 3rd, 1922. (200,095.)

17,089. "Portable wireless receiving set." H. G. Lauste. July 2nd, 1923. (219,470.)

18,410. "Electric switches for use in electric meters and for other purposes." J. H. Jacks and R. Hornby. July 17th, 1923. (219,483.)

18,875. "Joint box for making joints of electric cables." W. T. Glover and Co., Ltd., and C. J. Beaver. July 23rd, 1923. (219,486.)

19,382. "Electrically-heated water systems." H. Bohle. July 28th, 1923. (219,496.)

19,383. "Electric heating and cooking apparatus." H. Bohle. July 28th, 1923. (219,497.)

19,560. "Loud-speaking apparatus." British Thomson-Houston Co., Ltd. September 13th, 1922. (204,023.)

20,699. "Electric soldering or welding tool." L. Lombardi. August 14th, 1923. (219,514.)

21,848. "Electricity meters." Measurement, Ltd., and F. Holden. August 29th, 1923. (219,517.)

22,354. "Electric oil-break switch." Forges et Ateliers de Constructions Electriques de Jeumont. February 22nd, 1923. (211,827.)

22,906. "Circuit-breakers and the like." A. S. Cachemaille (Westinghouse Electric and Manufacturing Co.). September 12th, 1923. (219,527.)

24,209. "Automatic telephony." P. A. L. Anspach. September 30th, 1922. (204,719.)

26,751. "Electric liquid heaters and steam generators." A. D. Pou. October 25th, 1923. (219,546.)

27,175. "Controlled wireless telephony." R. Howe-Gould. November 3rd, 1922. (206,499.)

27,733. "Electrical switches." E. Bolton. November 5th, 1923. (219,558.)

27,745. "Shoes for train-carried contact members interacting with apparatus on the track." J. F. Webb, Junr. January 22nd, 1923. (Divided application on 219,345.) (219,551.)

27,760. "Electric water-heating apparatus and the like." K. F. Heesman and P. Kerkhoven. November 5th, 1923. (Convention date not granted.) (206,834.)

29,154. "Automatic telephone systems." Coventry Automatic Telephones, Ltd., and J. E. Collyer. November 19th, 1923. (Addition to 219,453.) (219,561.)

30,063. "Apparatus for the electrical precipitation of suspended particles from gaseous fluids." Lodge-Cotterell, Ltd. (Metallbank und Metallurgische Ges. Akt.-Ges.). November 29th, 1923. (219,570.)

30,913. "Electric induction furnaces and other apparatus heated by induction." Ajax Electrothermic Corporation. July 13th, 1923. (218,967.)

31,091. "Luminous electric heaters." Falkirk Iron Co., Ltd., and A. E. Wood. December 11th, 1923. (219,574.)

31,909. "Ignition plugs." R. Bosch Akt.-Ges. March 2nd, 1923. (212,223.)

32,050. "Friction-brake dynamometers." E. J. Collins. December 21st, 1923. (219,577.)

32,178. "Tanks for oil-immersed electrical apparatus." Metropolitan-Vickers Electrical Co., Ltd. December 29rd, 1922. (209,078.)

32,286. "Power transmitter." W. Fairweather (Singer Manufacturing Co.). December 27th, 1923. (219,582.)

1924.

2,062. "Variable electrical condensers." A. Sthegens. January 27th, 1923. (210,447.)

3,214. "Electric fly-killers." J. Ehrenbogen. February 7th, 1924. (219,603.)

3,545. "Sound-detecting apparatus." Walker Signal and Equipment Corporation and W. L. Walker. February 11th, 1924. (219,604.)

3,653. "Electric lamps for kinematographic and other projection apparatus." Pathé Cinéma Anciens Etablissements Pathé Frères. March 19th, 1923. (Addition to 189,743.) (219,330.)

4,192. "Electric pocket lamps." H. Lax (firm of) and B. Lax. February 18th, 1924. (219,607.)

4,811. "Speaking trumpet and sound receiver of the azimuth-measuring type." J. B. Perrin and A. J. Marcelin. May 12th, 1923. (215,719.)

5,963. "Electric plug-and-socket connections." J. A. Crabtree. March 8th, 1924. (219,615.)

9,858. "Elimination of parasitic disturbances in wireless receivers." Soc. Française Radio-Electrique. April 30th, 1923. (214,651.)

14,950. "Signalling systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). April 23rd, 1923. (Divided application on 10,969/23.) (219,636.)

14,988. "Telephone systems." Siemens Bros. & Co., Ltd., J. Berry, and C. L. Peters. March 24th, 1923. (Divided application on 217,981.) (219,637.)

1924.